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ABSTRACT

Originally intended for the Department of Housing and Urban Development, this literature survey can also serve the interests of public officials, participants in demonstration programs, and academics involved in delivering assistance to local officials. Reviewed is the literature relating to innovation, diffusion, organizational behavior, and public administration. The results of the literature summary, together with accompanying bibliographies, are presented in the narrative and appendixes. The background section briefly describes the approach and methodology used in carrying out the search and presents a summary of terminology, processes, and typologies as an introduction to the work. Chapters 3, 4, and 5 present the major substantive findings. Chapter 3 identifies and provides detailed discussion of four major categories of factors--individual, organizational, environmental, and innovation-specific--that influence organizational innovations and diffusion. Chapter 4 focuses on those factors that influence innovation in public bureaucracies. Chapter 5 summarizes major shortcomings found in the literature. (Author/IRT)

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FACTORS INVOLVED IN THE TRANSFER
OF INNOVATIONS:

A Summary and Organization of the Literature

January 1976

by

Public Affairs Counseling
A Division of Real Estate Research Corporation

for

Office of Policy Development and Research
Department of Housing and Urban Development

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I. INTRODUCTION

Public Affairs Counseling (PAC) is under contract with the Department of Housing and Urban Development (HUD) to assess and package the results of the HUD Capacity-Building Demonstration Program for local elected and appointed officials. In carrying out the assessment and packaging effort, it was important that HUD and the PAC team members have a common background and understanding of the processes involved in transferring capacity-building improvements to other local officials and for carrying out assessments of the demonstrations. Therefore, as a part of its packaging and assessment effort, PAC reviewed selected literature relating to innovation diffusion, organizational behavior and public administration for the purpose of providing HUD and the project team members with information contained in the current literature about critical factors involved in the transfer of capacity-building improvements, and aspects of organizational behavior and problems of public decision-making that are important to consider when implementing capacity-building improvements at the local level.

The intent then was to develop a working summary of the current literature keyed to the most current sources and to identify specific factors which affect transfer for the immediate use of team members during the assessment phase of the project. As this was being accomplished, and after review of the first working draft, it was felt that the document could serve the interests of a larger audience consisting of public officials who might wish a more ready access to this oftentimes confusing literature, participants in the demonstration program, and academics from other specialties involved in delivering assistance to local officials.

It should be emphasized that this summary is illustrative and comprehensive, but certainly not exhaustive. Because its primary function has been to provide an overview and a systematic presentation of factors hypothesized in the literature, it attempts to overcome the most noted characteristic of the body of empirical results on innovation: namely, that the findings often appear to be inconsistent. Many researchers, for example, have complained that upon testing a factor found by others to be important for innovation, they have found this same factor to be unimportant. Sometimes the same factors are found to be important, but in a direction reverse to that previously claimed. It should also be mentioned that, although real phenomena are involved, the literature has a very high proportion of conceptualistic verbalizing without much relation to empirical facts. The classifications are often largely intuitive and, in spite of their generalized form, are often based on very idiosyncratic circumstances.

Even though we found that the results have not been very cumulative, we agree with George Downs and Lawrence Mohr* that "when the body of existing theory and research work is organized properly -- when we know just how to examine it -- it may well constitute a powerful source of evidence bearing on important theoretical elements." We hope that this literature summary, in organizing and paraphrasing existing research, will assist those who have an interest in matching aspects of the literature with their own experience or understanding and overcoming the problem of inconsistency in innovation research. By so doing we hope that this effort will contribute to finding some of the common factors that permeate the present literature and to providing a body of experience to assist the public policy maker in overcoming the many barriers to effective implementation of his policy goals.

The major portion of the summary is concerned with explaining the factors that appear to be most relevant as barriers or inducements to innovations and their diffusion. Because of our interest in the implementation and diffusion of policy and resource management capability for public officials, particular emphasis is placed on bureaucratic organizational structures and innovation (both "hard" and "soft") in public agencies.

Major shortcomings of the literature are also discussed. We would agree with an unidentified critic who recently complained to Everett Rogers (a leader in the research into innovation and diffusion processes) that "diffusion research is a mile wide and an inch deep." We hope that our efforts in reviewing the existing literature and organizing a presentation of its major accomplishments, as well as in identifying its major shortcomings, will provide an impetus to both practitioners and researchers, individually and together, in their continuing efforts to deepen diffusion research in the interest of developing more appropriate practical tools for implementing improved decision-making processes for public officials.

Because the major purpose of this summary has been to represent the literature selectively and in compressed form, it has been difficult at times to separate our inferences and interjections from those being presented from the literature. We have made a conscientious effort to give credit in the text to all of the sources of the ideas that were utilized and to make distinctions between our own inferences and those drawn from the various quotations and summaries.

We alone accept responsibility for those instances where misleading statements and errors of fact occur.

*George W. Downs and Lawrence B. Mohr. "Conceptual Issues in the Study of Innovation;" paper delivered at the American Political Science Association Convention, San Francisco, California, September 1975.

The results of the literature summary, together with an accompanying bibliography, are presented in the narrative following and appendices. The Background section briefly describes the approach and methodology used in carrying out the search and presents a summary of terminology, processes and typologies as an introduction for those unfamiliar with the literature. Variations in description and usage, and problems and issues of comparability, are addressed to provide orientation to the substantive presentations in Chapters III, IV and V. Additional discussion and information on terminology, processes and typologies can be found in Appendix C for those who wish to pursue the subject further.

Chapters III, IV and V present the major substantive findings of our review and summary. Chapter III identifies and provides detailed discussion of four major categories of factors that influence organizational innovations and diffusion. The categories represent a group of the many diverse and specific factors that serve as barriers or incentives to diffusion which were found in the literature, a more detailed listing of which can be found in Appendix B. Chapter IV focuses specifically on those factors which influence innovation in public bureaucracies and Chapter V summarizes major shortcomings found in the literature.

Appendix A presents the bibliography and sources used in the course of the survey and includes examples of the academic fields scanned; a select bibliography that provided the basis for the substantive presentation; an extensive bibliography of innovations in state and local governments; and detailed annotations of three recent major works related to technological innovations in local and state governments.

II. BACKGROUND

A. Approach and Method

In our approach to organizing an inquiry into factors critical to the transfer of the capacity-building demonstration activities, it was our intent to build on current experience and existing sources of literature wherever possible. Public Affairs Counseling (PAC) assembled an Academic Advisory Group to assist in the identification of critical factors affecting the diffusion and transfer of the Capacity-Building Demonstrations and literature sources that had potential for those factors. PAC and the Academic Advisory Group determined that no specialized literature on the subject existed, requiring a literature search to cover selective portions of the works in innovation diffusion, organizational theory and public administration. Such a literature search would involve cutting across disciplinary fields such as political science, business management, economics, industrial management, rural sociology, social psychology, psychology, city planning, education, medicine, medical sociology, public opinion, geography and anthropology.

The Academic Advisory Group then identified broad directions for our literature search and specific sources. The Group continued to provide guidance throughout the conduct of the search and also provided review and comment on the final summary, although PAC assumes full responsibility for the study and its conclusions.

Building on the suggestions of the Academic Advisory Group, PAC utilized the following method:

- Broadly scanning published and unpublished materials;
- Selecting sources relevant to our area of inquiry for reading and summarization;
- Identifying and grouping transfer factors found in the literature for case studies and other aspects of assessment and packaging.

Standard bibliographic resources, journals and personal contact with principal researchers and investigators in the field were used to identify specific literature. These general sources of information and the academic fields scanned are listed in Appendix A(i) and (ii).

During the literature search over two hundred books, published and unpublished monographs, and reports were scanned. From this material we selected the sources presented in Appendix A(iii) as most relevant for the task at hand. Each of the selected sources was read thoroughly

and given a coded reference number. These reference numbers are used throughout this summary to indicate the particular source of ideas presented in the text. Consult Appendix A(iii), the select bibliography, to identify authors and sources. Most of the selected sources were copied and are on file with PAC. For the benefit of Federal, state and local decision makers and interested academic researchers, an extensive bibliography of other sources specifically relevant to innovation in state and local governments is compiled in Appendix A(iv).

With regard to innovations in public agencies, we reviewed three seminal works concerning technological innovation in state and local governments which have empirically tested, on large samples, many of the factors identified in our literature search. These works--The Adoption of Innovation by Local Government by Bingham; Tinkering with the System: Technological Innovations in State and Local Governments by Yin, Heald and Vogel; and Diffusion of Technology in State Mission-Oriented Agencies by Feller, Menzel and Engel--are annotated in detail in Appendix A(v), and are sometimes footnoted.

B. Summary of Terminologies, Processes and Typology

For the convenience of those unfamiliar with the literature, we have briefly summarized some of the basic terminologies, processes and typologies used to describe innovation and diffusion. A fuller explanation can be found in Appendix C.

(i) Terminologies

The literature sources abound in definitions and classification schemes. When attempts are made to relate findings or even theories and concepts across the various disciplines in which the literature on innovation and diffusion exists, the sheer abundance of definitions and classification schemes presents a problem. The problem is made more difficult because there is no inter-disciplinary glossary of antonyms and synonyms. Examples of different definitions of "organizational innovation" illustrate the dilemma:

- "A fundamental change in a significant number of tasks." (61,75)
- "First or early adoption of ideas." (7)

- "A change in the basic structure of an organization.... involving some rearrangement in the social relationships among various segments of an organization, the manner in which roles are played, etc." (25)
- "Change in the productive methods of technological leaders." (12)
- "It is also an innovation if an organization learns not to do something it formerly did, and proceeds to not do it in a sustained way." (65)

The degree of "newness" necessary for innovation to occur is a recurrent theme in the diffusion literature. Any idea or process can be "new" to an organization that first becomes aware of it. Thus, Everett Rogers and F. Shoemaker define innovation as:

"an idea, practice, or object perceived as new by the individual. It matters little, as far as human behavior is concerned, whether or not an idea is 'objectively' new as measured by the lapse of time since its first use or discovery. ...If the idea seems new and different to the individual, it is an innovation." (57)

Others offer similar definitions, such as:

"Adoption of a change new to an organization and to its relative environment." (38)

"When an organization learns to do something it did not know how to do before." (65)

It appears that "newness" should not be taken in its absolute or objective sense, but rather the relative newness of an idea to a given role or set of roles should be used, for it is in that context that obstacles to innovation will most frequently arise. In other words, we have emphasized that innovation itself is meant to exclude creativity per se and to include the notion of adopting something non-traditional whether it was invented within or outside of the organization concerned. We believe that relaxation of the requirements for newness in an absolute or objective sense is a constructive step in efforts towards achieving a viable framework for reference.

Given the diversity of definitions, we agree with Rowe and Boise that "attempts to suggest trends and areas of possible congruence can only be attempted with some risk." (60) It appears that:

- Most definitions of organizational innovation focus on change which is new to the implementing organization;
- Recent definitions which have been used in empirical studies tend not to include the generation of ideas and the first or early use of ideas as part of the criteria for identifying an innovation;
- It is too early to determine whether success and/or organizational intent criteria are likely to be included in emerging definitions of organizational innovations; and
- Little disagreement exists over the meaning of diffusion, the most comprehensive definition of which would involve acceptance for use, over time, of some specific idea or practice by individuals, groups or other adopting units, linked to specific channels of communication, to a social structure, and to a given system of values, or culture. (33, 37, 55, 67, 72)

(ii) Organizational Innovation Processes and Patterns of Transfer

A number of statements of innovative processes can be found in the literature on organizations. Among these, there are examples of several levels of analysis, e.g., individual, organizational, and extra-organizational. Rowe and Boise, however, suggest that "the analytical components of these formulations are sufficiently similar to suggest a generic innovative process." (60)

The models offered by Knight, Utterback, and Clark provide a set of generic components for innovative processes. Based on this, Rowe and Boise advocate that a comprehensive conceptualization of the organizational innovative process would include the following broad stages:

- Knowledge accumulation
- Formulation of an innovation
- Decision
- Implementation
- Diffusion

It appears that "whether an innovation begins and ends with a single individual or whether an innovation involves an entire organization, the same basic elements are likely to be involved." (60)

Everett Rogers describes the adoption process as "a mental process through which an individual passes from first hearing about an innovation to final adoption." (55) He conceptualizes the adoption process in five steps or stages:

- (1) Awareness
- (2) Interest
- (3) Evaluation
- (4) Trial
- (5) Adoption

Rogers also postulates a continuum of "innovativeness" partitioned into five adopter categories:

- (1) Innovators
- (2) Early Adopters
- (3) Early Majority
- (4) Late Majority
- (5) Laggards

The five adopter categories are ideal types, conceptualizations that are based on observations of reality and designed to institute comparisons. The dominant values of each category are: innovators - venturesome; early adopters - respect; early majority - deliberate; late majority - skeptical; and laggards - tradition.

There is a mode of analysis commonly lumped under the general rubric of "innovation research" which focuses neither on the determinants of the adoptability of innovations nor on the determinants of innovation among organizations. Instead, it focuses on the patterns by which innovations diffuse and the comparison of those patterns. (28, 31, 33, 35, 49, 57, 63, 70) Frequently the pattern which emerges resembles the "S" curve characteristic of a logistic growth function or a cumulative normal distribution, although not always.

(iii) Categories and Typologies of Innovations

Beyond the matters of definition and differential transfer rates, authors seem to be interested in classifying innovations. Most are two-way classifications such as routine and non-routine, and internal and external innovations. (38, 45, 65, 75)

Although most classification schemes appear to have little apparent purpose other than to fill boxes, there are some commonalities in the various classifications offered which might lead to theoretical contributions. One common thread is that any proposal which would alter the organization itself is more radical or difficult to accomplish than a proposal that does not do so. The latter kind of proposal usually is associated with some change in the output of the organization. Thus a differential rate of innovation can be expected to exist between these two kinds of innovation. (8)

Other examples of categorization schemes or typologies of innovations are plentiful. For instance, the determinants of high-cost innovations would seem to be markedly different from those of low-cost innovations. To begin with, wealth or resources would clearly predict the former differently from the latter. "Resource levels might explain much of the variation in the adoption of elaborate EDP systems by corporations but be relatively unrelated to their adoption of new supervisory techniques or job enrichment programs." (47)

Knight (38) suggests a typology with the following four components:

- "Product or service innovations": the introduction of new products or services which the organization produces, sells, or gives away.
- "Production-process innovations": the introduction of new elements in the organization's task, decision, and information system or its physical production or service operations, the advances in the technology of the company.
- "Organizational-structure innovation": the introduction of altered work assignments, authority relations, communication systems, or formal rewards systems into the organization. This category is in part complementary to production-process innovations since it includes the formal interactions and authority relations among the participants in the organization

that are established to form the production process. In addition, this third category includes the other aspects of formal interaction among the people in the organization.

- "People innovation": one of the alternatives that produces direct changes in the people within an organization: (a) making personnel changes, (b) modifying attitudes and behavior or people in the organization through education or new management techniques, and (c) providing greater incentive systems.

III. FACTORS INFLUENCING ORGANIZATIONAL INNOVATIONS AND DIFFUSIONS

The framework developed for transfer factors, as implied by the literature, involves four major categories that group the individual factors influencing innovations and their diffusions. These we termed "individual factors," "organizational factors," "environmental factors," and those others unique to the innovation being theorized about or tested -- "innovation specific factors." A few examples are as follows:

- A. Individual factors include the manager or key decision maker's attitude toward innovation or change-agents. The level of information contact with "outsiders" and aversion to risk-taking are also among the factors under this heading, as is the degree of career self-interest.
- B. Organizational factors include such variables as the amount of organizational "slack" (uncommitted resources), the organization's size and its history of past innovativeness along with level of bureaucratization.
- C. Environmental factors include the behavior of competitors and other organizations, crisis situations and clientele pressure for change.
- D. Innovation specific factors are usually concerned with cost, magnitude of benefits as well as the depth of individual and/or organizational structure change involved.

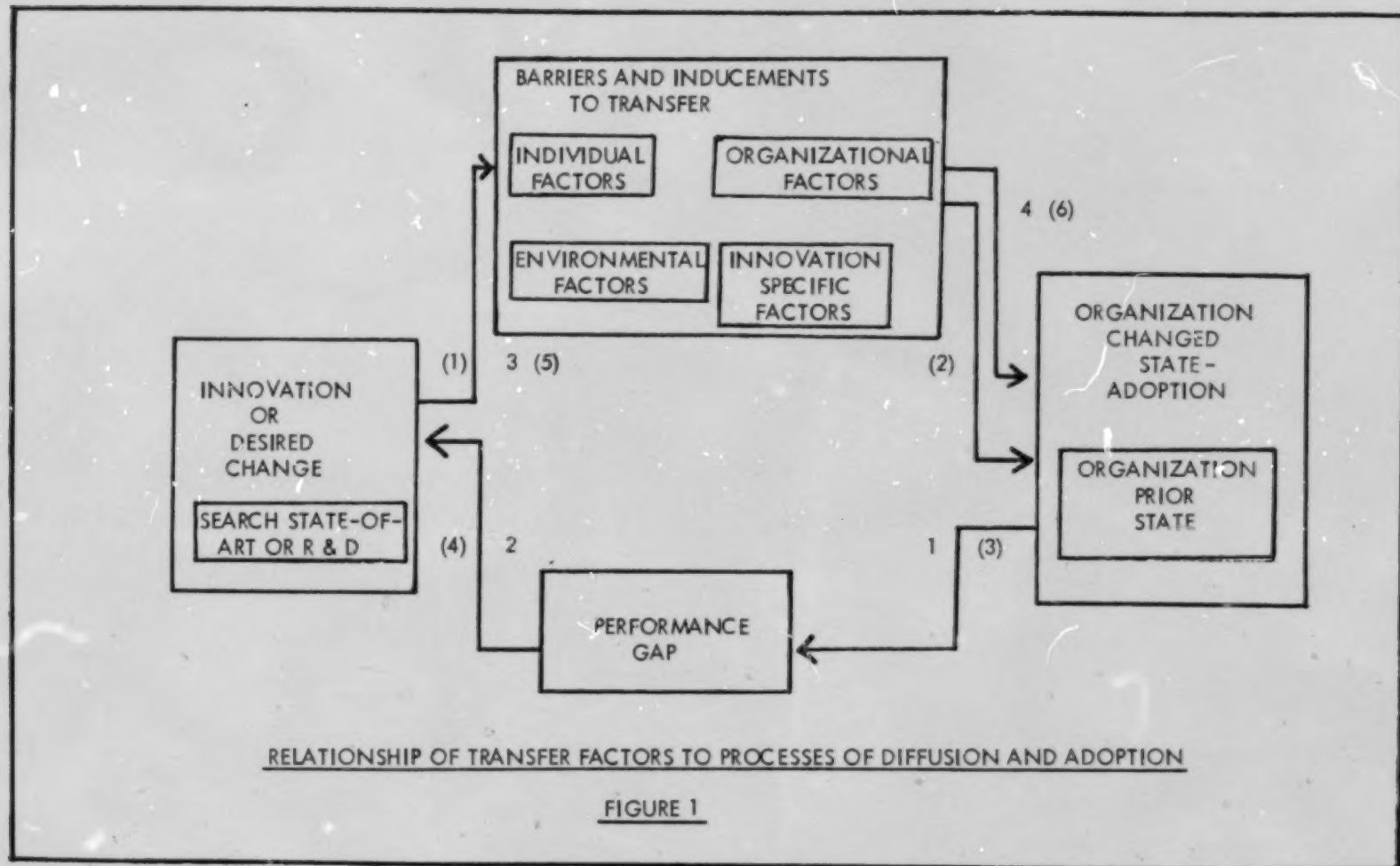
Since almost always the lack of a factor influencing the adoption of an innovation or its diffusion is considered as a barrier to the same, and vice versa, we have found it convenient for the sake of brevity and usefulness to decision makers and researchers to construct a Summary Matrix (Table 1) specifying the factors that we have found to be salient for influencing innovations and their diffusions.

The transfer factors we have summarized from the literature can be looked upon as barriers or inducements to transfer. For example, recognition of a performance gap can initiate a desired change resulting in the creation of, or search for, an innovation. Or, an innovation can induce the recognition of a performance gap leading to a desire for change. The factors can also function as barriers that must be overcome, or conditions that must obtain, to achieve a changed state in the organization. A conceptualization of the important relationships between the transfer factors and the processes of innovation diffusion and adoption by an organization, based on our experience and the literature, are suggested in Figure 1. The extent to which the factors identified in the literature interact, or are crucial to building the policy and resource management capacity of local elected and appointed officials, can only be surmised at this time -- given our reading of the available literature. The discussion of these factors as embedded in the literature is presented below.

TABLE I
SUMMARY MATRIX
FACTORS INFLUENCING INNOVATIONS AND DIFFUSIONS

(A) INDIVIDUAL	(B) ORGANIZATIONAL	(C) ENVIRONMENTAL	(D) INNOVATION SPECIFIC
(i) Performance Gap Level of Satisfaction with Organization's Present Course of Action and Performance (21, 47, 71, 72, 76)* Need for New Tools, Techniques and Structures (15, 21, 71, 76) (ii) Key Decision Makers Key Individual, Favorable or Unfavorable Attitude Toward Innovation and/or Change-Agent (6, 14, 33, 55, 66) Executive Ideology, Conservative, etc. (21, 22) Degree of Professionalism and Cosmopolitanism (6, 15, 16, 33, 47, 55, 56, 57, 67, 76) Degree of Executive Organizational Membership (15, 55, 57) Opinion Leadership (5, 11, 37, 55, 56, 57) Administrative Role and Position (4) (iii) General Subjective Factors Level of Aversion to Risk Taking -- Political, Economic, etc. (6, 11, 66, 68) "Modern" or "Traditional" Orientation of Individual (55) Degree of Protection of Social Status and Privilege (11) Degree of Career Self-Interest and Job Security Threats (11, 13, 14, 21, 33, 68) Level of Desires for Self-Appraisalment (21) Level of Trust of Industry Experts and Other Change-Agents (5, 55, 68) (iv) General Objective Factors Level of Information Contact with "Outsiders" (44, 55, 56, 57) Level of Knowledge and Motivation about Innovation (51, 55) Number of Individual Biases/Screening Out Data, etc. (21) Degree of Technical Evaluation Capabilities (68) Level of Intra-Organizational Personal Contact (19, 28, 29)	(i) Size and Resource-Related Factors Organizational Size (4, 33, 43, 44, 47, 51) Amount of Resources (23, 33, 47, 68) Budget Constraints (43, 44, 68) Amount of Uncommitted Resources -- Organizational "Slack" (20, 38, 45, 47, 50, 51, 67, 70, 76) Organizational Prestige (47) (ii) Organization Structural Factors Intra-Organizational Climate (4, 17, 21, 27, 30, 33, 54, 59, 61, 62, 55, 69, 76) Degree of Internal Complexity, Centralization or De-centralization of Power: Degree of Formalization, Stratification and Job Codification (3, 4, 13, 17, 32, 33, 47, 65, 76) Level of Tolerance for Diverse Viewpoints (21, 61, 75) Level of Bureaucratization (2, 3, 9, 10, 18, 39, 52, 57, 67, 68) Adequacy of Internal Incentive Reward Structures (21, 33, 75) "Open" Intra-Organizational Communications Channels (33, 47) Level of Participation in Decision Making Processes (33, 35, 47) Effective Communications Channels Between Organization and Technical Information Sources (51, 55, 69) Presence of Technical Evaluation Unit (68) Objectively Determined Rules for Performance Goals (72, 76) Job Rotation (33) Change of Leadership (33) "The Wilson Paradox" = Structures Allowing Diversity of Viewpoints Are Ones in Which Innovation Implementation is Most Difficult (21, 61, 75) (iii) Factors Concerned With The Organization's Function and Performance Internal Technical Change (21) Organizational Memory/Inertia (11, 21, 33, 68) Past Innovativeness (28, 47, 55, 67, 70, 76) Level of Morale and Job Satisfaction (32) Level of Emphasis on Efficiency and Production Volume (32, 41, 76) Level of Autonomy and Independence of Operations (21, 22, 67) Level of Personnel Turnover (21, 66, 76)	(i) Market-Related Factors Crisis or Sudden Change in Demand (5, 18, 21, 33, 40, 55, 57, 69, 76) Stability of External Environment (21, 40, 76) Technology Changes (18, 21, 24, 76) Stability of Input Costs (18, 24, 43, 44, 69) Citizen Demands for Public Goods/Services (47) (ii) Clientela/Community Characteristics Degree of Community Growth (1, 7) Homogeneity of Community (1, 63) Community Wealth (4, 28, 70) Levels of Urbanization, Industrialization and Cosmopolitanism of Community (55, 57, 70) Political Culture -- Minority or Majority with "Public Regarding" Values (1, 75) Degree of Centralization of Formal Political Structure in the Community (1, 15, 16, 19) Degree of Political Party Competition (29, 47, 71) Age and Size of City (1) (iii) Other Organizations As Factors Level of Inter-Organizational Contact (33, 35, 70) Interaction Among Users and Potential Users (47, 73) Peer Group Influence (9, 56) Competition and Emulation (33, 70, 71) Pervasiveness of Innovativeness (28, 47, 70) Behavior of Competing Organizations (44, 45) Supplier Activities and Marketing Strategies (47) "Outside" Individuals in Organizations (16, 33) Inter-city and Inter-state Influence (19, 28, 70) Presence and Activity of Public Interest Groups, Consultants and Commercial and Non-Commercial Change-Agents (33, 47)	(i) Factors Involving Costs and Benefits Level of Initial Financial Costs (23, 26, 47) Maintenance Costs, Rapidity of Cost Recovery and Regularity of Financial Return (23, 26) Level of Profitability (12, 23, 26, 43) "Sunk" Costs of old Tool or Technique, etc. (12, 21) Depth of Overall Individual or Organizational Change (21, 38, 53, 78) Radicalness of the Change (58) Amount of Organizational Space Affected (59) Amount of Persons Affected (21, 38) Size of Threat to Self-Interests (11, 21, 68) Political Risks and Vested Interests Affected (19, 68) Magnitude of Benefits (12, 23, 26) The Innovation's Relative Advantage, Compatibility, Complexity, Trialability and Observability (9, 15, 55, 57, 66) (ii) Factors Directly Concerned With Extra-Organizational Influence Amount of Interaction Between Users and Potentials (47, 73) Level of Awareness and Knowledge of Innovation (33, 36, 37, 45, 70) Level of Information Diffusion (48) Knowledge of Where to Look for Assistance (42) Availability of Performance Cost Data Supplied by Previous Users or Other Change-Agents (58) Right Influence (Personal and/or Media) at the Right Time (55, 56, 57) Prestige and Personality of Change-Agent (5) Personal and Organizational Relationship between Change-Agent and Potential Adopters (5, 46, 70) Support of Majority Now or in Near Future (5) Presence or Absence of Political Constituency -- Innovations Rarely Elect Officials (42)

* (21, 47, ...) Reference numbers in the chart and throughout the text refer to sources listed in the Selected Bibliography. See Appendix A (iii).



A. Individual Factors

Individual factors can be analyzed under four sub-groupings: (i) Performance Gap, (ii) Key Decision Makers, (iii) General Subjective Factors, and (iv) General Objective Factors.

(i) Performance Gap

As briefly mentioned, the performance gap occupies a critical, initiating phase in many theories of organizational innovation. "The impetus to innovation arises when organizational decision makers perceive that the organization's present course is unsatisfactory." (76) Anihony Downs views it as "the difference in utility he (the decision maker) perceives between the actual and the satisfactory level of performance (of his organization)." (21) Once recognized, Downs claims that "such a gap provides the stimulus for search behavior to find means of closing the gap." These solutions may entail innovation, the adoption of new ideas, processes, tools, or techniques. But there is no guarantee that those alternatives will also be satisfactory to the persons for whom the organization's function is being performed. In fact, the official himself, his rivals in the office, his superiors, the various people in the organization's "clientele" all usually have varying opinions about what constitutes a "desired" performance by the official. Consequently, "there is no single measurement of the 'true' performance gap of any individual, official, or bureau/organization." (21)

Nevertheless, the concept of a performance gap is essential in explaining the causes of organizational change. All organizations alter their behavior patterns when someone believes that a significant discrepancy exists between what it is doing and what it "ought" to be doing.

"Many factors have been identified as precipitating performance gaps: exogenously generated changes in technology, changes in market conditions, entry of new personnel, and changes in power relations between the organization and its external environment, for example." (47) These and other causes will be dealt with in the relevant upcoming sections of this report.

(ii) Key Decision Makers

Many studies have theorized and tested the importance of key individuals, usually executives, in the organizational innovation

process.(4, 6, 14, 15, 21, 22, 33, 55, 57, 67, 76) Leadership behavior serves both as a stimulus and as a model for much behavior in the organization. It has been found that following the recognition of a performance gap, a key individual's favorable or unfavorable attitude is often crucial to the innovation's subsequent success or failure.(14, 55) Usually this attitude is based on some form of executive ideology. Researching the area of executive ideology, George Downs has found that the impact on correctional innovation raises dramatically depending on the amount of authority possessed by the executive.(22) Investigating the implementation of a successful unit management program in various California hospitals, Sherman found that "it was much more likely if there was one key person providing leadership during planning and if the chief executive officer and/or his immediate subordinates were directly involved during the planning stage."(66)

It has been suggested by some authors that organizational innovation and early adoption thereof is associated with professionalism, that is, that members of early adopting units are simply better informed or have a wider network of professional contacts than their counterparts in late adopting agencies.(6, 15, 33, 47, 55, 56, 57, 67) A professional usually possesses specialized knowledge and skills, firmly believes that he alone is capable of deciding how to perform his work, views his work as a lifelong pursuit, and generally recognizes that his decisions may inflict harm or injury upon his clients and the public. An organization member with strong professional ties is often interested in advancing his or her profession. In many cases, however, such a person's organizational commitment may be less important than the desire to actively pursue interests in a chosen specialty field. "If an innovation goes against such a person's professional interests, even if it would be beneficial to the organization, that innovation will often be prevented."(33)

Although Rogers and others have emphasized this factor of professionalism and its accompanying high propensity for organizational membership and "cosmopolitaness", little empirical proof has been forthcoming on this issue. Recently, however, Menzel has tested various hypotheses directly related to professionalism and found it to be of little significance, "at least as far as facilitating or inhibiting the adoption of new technologies by state air pollution and highway transportation agencies." In the main, Menzel reports that "state agency officials identified variables external to their agency as primarily responsible for stimulating adoption."(47)

In addition to a positive professional orientation, Rogers claimed that opinion leadership status within a relevant communications network was associated with the propensity to innovate.(55) Such studies utilize the "two- (or multi-) step flow" hypothesis, suggesting that leaders become informed of new things by sources outside their group, and then selectively pass this information along to their peers.(37) Most investigations are able to show that opinion leaders utilize a greater number of outside-the-group sources of information about new things than do their "followers."(16, 55)

On the other hand, a tradition locating innovative behavior in individuals outside the mainstream of their society is evidenced in a large portion of the literature of anthropology and, to a lesser extent, sociology. For example, Barnett viewed innovators as "individuals with the least opportunity for full participation in the most valued activities of their own society." (5) While another author claims that "marginal men are found to be responsible for many scientific and social innovations of substantial consequence." (11)

"The implied conflict between findings favoring leaders as innovators and studies supporting the notion of marginals as advocates of change seems to be largely the result of differences in the research conditions from which these groups of theories arose."* A study by Becker traced the diffusion paths of two innovations (with different degrees of "adoptive potential") among directors of local health departments in three states. He reported substantial correlations between time of adoption of studied innovations and both relative centrality in the group's communication networks and several rankings of most-valued sources of information. Pioneer adopters of the low adoptive potential innovation were identified as "marginals," while earliest adopters of the high adoptive potential innovation were found to be individuals with high relative centrality ("opinion leaders"). (6)

Becker also presents data in support of a modified model for diffusion among professionals; suggesting that "the professional's innovativeness determines his centrality in the communication network and, further, that a desire to maintain or increase prestige (tempered by risks of adoption) motivates the professional to seek sources which are most likely to provide information on innovations." Data were also presented by Becker in support of the view that "low adoptive potential innovation pioneers innovate to obtain prestige in their communities, while high adoptive potential innovation pioneers adopt earliest to gain the admiration of their professional peers." (6)

Factors that bridge the individual level and the organizational level are organizational positions and authority roles. Because these factors do concern key decision makers, they are included in this sub-section. In a study of educational innovations in the San Francisco Bay Area, Baldrige and Burnham found a number of positional characteristics that influenced the adoption of change.(4) "The chairman and administrator were nominated more often than teachers as (a) indicators of change, (b) evaluators of the quality of work in the change process, and (c) controlling organization sanctions such as salaries and working conditions." Department chairmen were also seen as particularly important communication links between teachers carrying out changes and administrators supporting those changes with resources. This study's data also tended to support the hypothesis that "administrators are extremely important as boundary people: that is, they serve as a link between demands and ideas from the outside and the innovation being adopted within the schools." In sum, Baldrige and Burnham conclude that "it appeared that although individual characteristics were not particularly critical in predicting who would be leader in change efforts, organizational position and role were highly influential."(4)

(iii) General Subjective Factors

Other authors have discussed the individual's level of aversion to risk taking as an influence to innovations, the general consensus being that the more risk-averse individuals are, the less likely they are to innovate because of the political or economic chances involved. (6, 11, 66, 68)

Since early studies, social scientists have conceptualized opposing pairs of ideal types, which are called "polar types" for the purpose of analyzing behavior occurring within social systems. Rogers' conceptualization of "traditional" and "modern" norms is a synthesis, at least in part, of various aspects of these previous typologies. "A number of synonyms may be used to describe modern norms: innovative, progressive, developed, scientific, rational, and so on." For Rogers, the crucial dimension is "that individuals in social systems with modern norms view change favorably, predisposing them to adopt new ideas more rapidly than individuals in traditional systems. A social system with modern norms is more change oriented, technologically developed, scientific, rational, cosmopolite, and empathic." A traditional system embodies the opposite characteristics. (55, 57) The evidence to date appears more culture-bound than relevant to organizational innovations.

Many people view any organizational change as a threat to their personal social status and/or job security. Researchers have found that if these individuals happen to be managers and/or are in an organizational position where they have considerable input in the decision making process of their organization, then these people represent a substantial barrier to most innovative proposals. (11, 13, 14, 21, 33, 68)

Job threats are obviously important when considering technological innovations in public agencies. Civil service groups and the increasing number of unions in the public sector almost invariably can be expected to fight actively to prevent unemployment. Therefore the incentive to cut down expenditures through implementing labor saving tools, techniques or processes will likely be reduced whenever the innovation requires the loss of jobs.

Another major individual motive causing change in organizations is the personal desire for aggrandizement. Anthony Downs claims that "although this desire may be partly altruistic, it always has some roots in the self-interest of the officials who exhibit it." (21) Self-interest is a powerful cause of inertia, but Downs asserts that "it can also motivate change if officials receive greater rewards for altering the status quo than preserving it. The greatest of such rewards are gains in power, income, and prestige associated with increases in the resources controlled by a given official or a given bureau." (21) Theories concerning this desire appear to have remained virtually untested.

Often decision makers, especially those in public service, have little trust in industry experts and other change-agents. (5, 55, 68) Menzel points out that city officials often distrust industry experts. These officials "feel that industry does not really understand the problems and the city environment. Some cities in the past have been sold new and unworkable technology--perhaps a computer-run traffic control system. Even with a fully tested item, industry experts often do not explain the operation in language city officials understand." (47)

(iv) General Objective Factors

According to Rogers and other interaction theorists, adoption is closely associated with personal and professional contacts that members of organizations and public agencies have with one another. (44, 55, 56, 57) Interaction theory appears most plausible for the large number of states described as followers. (70) Early and late adoption are not

explained by this interaction but are said to result from the peculiar properties of the adopter or the circumstances of the adoption. If these conditional propositions are true, then one should expect to find that early and late adopters have fewer contacts with other states than the large middle group of adopters. Menzel appears to be the only source who has attempted to test this out, and his findings do not support the hypothesis that interaction is greatest among followers. (47)

Level of knowledge and motivation about innovation have been shown in two studies to be related to innovation. (51, 55) "As each official goes through the decision and action process, he behaves somewhat differently from the way he would if his goals were identical to the formal purposes of the organization." (21) Downs points out that among the individual biases relevant to searching for information are the following:

- "His perception apparatus will partially screen out data adverse to his interest, and magnify those favoring his interests. The probability that important data will not be screened out by such biases can be increased by assigning overlapping search responsibilities to persons with different and even conflicting interests and policy preferences, or assigning search tasks to persons who have no particular policy preferences and whose interests are not connected with the advancement of any bureau section."
- "In formulating alternative actions, each official will tend to give undue precedence to alternatives most favorable to his interests and to those about which adequate consensus can most easily be established. The process of decision making within a bureau involves significant costs. This implies that the order in which alternative actions are assembled and evaluated may have an extremely important impact on what an organization eventually does. If the first set of alternatives considered contains at least one that closes the performance gap, the bureau may never discover other alternatives that would not only close that gap, but also provide a new higher level of performance."
- "As a result, any biases among officials that cause certain types of alternatives to be systematically considered early in the game will cause those types of alternatives to be adopted more often than they would be if officials were unbiased."

One is tempted to believe that data exists to support or refute Downs' theories concerning those individual biases and screening processes, but none were found during our current literature search.

Oftentimes organizations, especially small ones, and public agencies lack technical evaluation capabilities. (68) Cities, for instance, usually do not have scientific or technical advisors. Without expert advice, these agencies "are in a poor position to evaluate the offerings of industry or to define their needs in terms of specific problems which the research and development community could solve." (47)

Also shown to encourage innovation is a high level of intra-organizational personal contact so that performance gaps observed by staff gain speedy recognition and acceptance by managers. (19, 28, 29)

B. Organizational Factors

The various organizational factors can be organized into the following subgroups: (i) Size and Resource-Related Factors, (ii) Organization Structural Factors and (iii) Factors concerned with the Organization's Functions and Performance.

(i) Size and Resource-Related Factors

Size appears as a ubiquitous variable in the literature, but it has been used in several different ways by various researchers. Reviews of studies relating size to aspects both of centralization and formalization appear to be largely inconsistent, at least on the basis of research that has been accomplished to date.

In a study of 294 industrial firms, Mansfield found that the larger organizations adopted new ideas and technologies at a faster rate than the smaller organizations. (44)

Baldrige and Burnham in their study of innovation in public schools, found that "the size of the organization greatly affects innovation not only by promoting complexity but by creating problems of coordination, control, and management which, in themselves, demand innovative practices.... Moreover, increased size produced critical masses for certain problems that stimulated the adoption of innovations to handle them. For example, a small school district was unlikely to have

enough handicapped students to initiate special programs for them, but a large district was apt to have many such programs. Finally, increased size expanded the possibilities for interacting with the environment of the school district, since additional clients multiply the number of interested outsiders making their special demands."(4)

There are several reasons why size may have different consequences for a factor such as complexity, and, thus, ultimately for the rate of organizational change. If the hiring of additional persons means the addition of new occupational specialties, then increasing size probably leads to a higher rate of organizational change for reasons argued previously. "If the hiring of additional persons means only the addition of more job occupants in existing occupations, and no new occupational specialties, then increasing size may result in increasing centralization and lack of organizational change."(33)

In Mohr's seminal work on the determinants of innovation in organizations, based on data gathered in 93 local public health agencies, the variable emerging as by far the most powerful predictor of innovation was size, but he concluded that this relationship cannot be considered theoretically complete. Rather, "size should be expected to predict innovativeness only insofar as it implies the presence of motivation, obstacles and resources." In the case of these local public health agencies, organizational size proved to be "an excellent indicator of the relevant resources available to local health departments for the adoption of a large number of non-traditional programs."(51)

With regard to many kinds of innovation in public organizations, Mohr reports that "the relationships among community size, organizational size, and extent of innovation form a developmental sequence. Larger communities generally require larger service organizations, and it is the resources of the larger organization that lead to innovation. Thus, large organizations in small communities may be expected to adopt many innovations: small organizations in large communities will adopt few."(51)

The economic situation of an organization has an impact upon the amount of knowledge it can accept and utilize; after all, new programs or new techniques require funds.(33) The amount of finances, like the size of the organization, can affect the degree of acceptance or resistance to organizational change. Organizations, whether profit making or nonprofit making, may very well institute more changes if

they have ample funds. On the other hand, lack of adequate financial resources may restrict the possibility of program change in spite of the orientation and commitments of the membership.

Agency resources, particularly budget and manpower complements, are generally held to condition agency responsiveness to new techniques. "Such resources, however, may in fact serve as either direct indicators of a factor shaping the propensity to innovate or as surrogates for factors entering into the adoption decision." (33) With respect to budget constraints, for instance, there is considerable support, particularly from Mansfield's work, that the ratio of the cost of a new technique to the size of a firm (measured by financial assets) is a major factor in determining which firms in any industry will adopt the technique. (43, 44) Other writers have reported that city purchasers, for instance, are generally obliged to buy at the lowest price. The technologically innovative product with a higher initial cost is therefore likely to be passed over. (68)

Mansfield also found that financial health, as measured by profits, liquidity and growth rate, bore no close relationship to the length of time that firms wait before introducing a new technique. (44)

One other aspect of agency resources which occupies a large role in several theories of organizational innovation is the existence of "slack" resources. Cyert and March define slack as the "difference between the payments required to maintain the organization and the resources obtained from the environment by the coalition." (20) Having operationalized this definition, many authors have found this to be a useful indicator for innovation (20, 38, 45, 47, 50, 51, 67, 70, 76) and their research attributes a great deal of innovation in organizations, especially large or successful ones, to "slack" resources. After solution of immediate problems, the quest for prestige rather than the quest for organizational effectiveness or corporate profit motivates the adoption of most new programs and technologies. "Other things being equal, the more prestige a person or group has, the more likely it is that that individual or group will be able to influence other persons, groups, or situations." Menzel's study, however, found this factor little related to innovation in public agencies. (47)

(ii) Organization Structural Factors

Many authors discuss the intra-organizational climate produced as a result of structural factors (4, 17, 21, 27, 30, 33, 54, 59, 61, 62, 65, 69, 76), the most important of which are presented here.

Organizational complexity has been defined as the "number of occupational specialities in the organization and their professionalism with a very differentiated task structure." (76) In other words it is a two dimensional concept based on the general assumption that the greater the number of occupations professionalized, and/or requiring training, the greater the complexity of the organization.

Expertise requires both training and experience. The service ideal usually forces persons to seek new knowledge continually in order to better serve their clients' interests. Professionalism implies a considerable appetite for knowledge, and this acquisition often leads to the recognition of how little a professional really knows about his or her own particular specialized area, thereby inspiring that person to greater learning. The existence of many specialists in different fields is likely to increase the range and quality of information available to the organization and to generate increased awareness of existing organizational performance gaps and of solutions to these gaps. Indeed, Menzel views the awareness of gaps and of solutions as being interrelated in terms of Walker's concept of relative deprivation. "Specialists in an organization learn, through their professionalism roles and the associated information network, of the existence (and possible employment in comparable organizations) of performance standards and of technologies not in use in their organization. They are thus led to advocate change in their own organizations." (47)

With respect to other factors encouraging innovation, Hage and Aiken claim that "the greater the number of different occupations, the more diverse the perspectives and values of the members within the organization. Each occupation will compete for its fair share of organizational power and rewards. From this occupational conflict can come the impetus for change." This diversity of expectations and solutions within an organization is held to be a source of organizational conflict and leads to the hypothesis that organizational complexity is directly related to the generation of proposals for innovation.

Not surprisingly, most of the available evidence to support organizational complexity being an important factor influencing innovation is found in studies of complex organizations such as schools and hospitals. (4, 76) Burns and Stalker in a study of electronics firms found that "there was considerable conflict over the allocation of organizational resources as well as the development of many new products in those firms that placed greater emphasis on person specialization." (13)

The interpretation of organizational complexity in Menzel's research was somewhat contradictory. In a formal sense, he did not find it to be a significant factor in accounting for interstate variations in adoption of technologies in given functional fields. "In part, this was attributable to the observation that state highway departments closely resembled one another in terms of formal structure." In terms of the decision to adopt a specific technique, however, he considered organizational complexity to take on a far more important, if somewhat different, role than that generally ascribed to it. In particular, "it was related to the type of search behavior and evaluation criteria employed by different levels of an organization and to the recognition that technologies are instruments to achieve given ends." (47)

Centralization relates to the "locus of the authority and decision making in the organization. The greater the hierarchy of authority (the higher in the organization decision making takes place) and less participation that exists in the organization, the greater the centralization and vice versa." (76) The effects are viewed as mixed. To the extent that information in centralized organizations tends to flow in vertical lines through the hierarchy with little opportunity for communication across functional divisions, there is less opportunity to perceive performance gaps or to elevate the utility of new solutions lying at the boundaries of responsibility of each subunit to the overall goals of the organization. Havelock notes that centralization is held to increase the number of thresholds which a proposed innovation must cross. "In the absence of any clear directive from higher levels in the organization that goals are not being attained and that a conscious search activity for alternatives must therefore be undertaken, subordinate gate-keepers may be assumed to have asymmetrical perceptions of gains and losses from risk-taking and thereby create a gauntlet of abominable no-men." On the other hand, Havelock also points out that "it has been argued that decentralization can serve as a barrier to innovation, whereby affected units can, in effect, exercise independent veto power over solutions proposed at

some central, superior level."(33) Hage and Aiken, in contrast, not only claim that "decentralization encourages the process of occupational conflict inherent in a complex organization," but also that "it facilitates the initiation of new programs and techniques, whether the source of the idea is internal or external to the organization."

Many students of bureaucracy have long believed that greater centralization produced greater efficiency and more effective performance. Havelock states "that this is not always the case would appear to be satisfactorily demonstrated by the inertia and backwardness of some of the largest centralized big city school systems and also by the apparent inability of the highly centralized ones in the vital area of vehicle safety."(33)

Two distinctions seem relevant here. The one most commonly made in the organizational literature is that between innovation and implementation; that is, centralization may not be conducive to innovation, or more properly to proposals for innovation, but may be conducive to implementation. The same contradictory conclusions have also been reached for decentralization. The second distinction is that the extent to which centralization affects innovation may vary according to the type of innovation under study. Feller, Menzel and Engel in their recent empirical work* reflect our findings when they claim that it is difficult to treat some of the findings on the centralization-decentralization issue as not being dependent to a considerable extent on the specific innovations chosen for study."

Harvey Sapolsky's study of the resistance to innovation in department stores is often cited as evidence that decentralization is inimicable to innovation.(61) Roger Corwin's work is likewise cited as an indication that "the more decentralized the decision process, the greater the opportunity for different groups and individuals to express disagreement."(17) This increased participation is held to foster freer, more open discussions

* Irwin Feller, Donald Menzel and Alfred J. Engel, Diffusion of Technology in State Mission-Oriented Agencies, Institute for Research on Human Resources, Center for the Study of Science Policy, Pennsylvania State University, October 1974: for a detailed annotation of this work see Appendix A(v).

of organizational performance and of alternatives to existing practices. Archibald and Hoffman's "strategy" for fostering innovation in police departments similarly involves the creation of task forces which would circumvent existing hierarchical barriers to change.(3) Yet Corwin, in his empirical work on factors associated with the introduction of new technologies in schools, found that centralization did indeed foster innovations. He claims that:

"The positive correlation between the centralization of the decision-making structure and technological change... is at variance with the widely held assumption that decentralized systems are more adaptable. The higher administration was usually responsible for introducing this program to the schools... In other words, a centralized organization does not for that reason necessarily resist change; rather centralization gives it the capacity to select and enforce innovations as well as to resist them."(17)

The assumption that centralization acts as a barrier to innovation results from a tendency to equate change as being synonymous with innovation, and to note that organizations seek a form of equilibrium. Thus, Shepard argues:

"Efforts to innovate must be relegated to the categories of error, irresponsibility, and insubordination, and appropriate corrective action taken to bring the would-be innovators back in line. Any change is likely to run counter to certain vested interests and to violate certain territorial rights." (65)

Yet another factor viewed as being relevant for innovation is the level of organizational formalization, which refers to "the emphasis placed within the organization on following specific rules and procedures in performing one's job."(76) Formalization is thought by some to stifle the search for new information and thus to reduce the possibilities of learning about new approaches.(4, 17, 32) Further, "formalization of rules is likely to increase perceptions of an asymmetrical reward structure, in which the punishment for deviating from prescribed behavior is greater than the rewards for successfully adopting a novel approach to situations in which adherence to posted rules appears to be clearly inadequate."(3)

Rules set limits not only on what people do but also on what they think. Rules are not only the repository of past experience, but they may become the bulwark against future proposals. "A highly formalized job provides little latitude to the occupants of the job for considering alternative procedures or practices. As a consequence, little initiative is likely to be exercised. In fact, to take initiative may get the employee into trouble for not following the prescribed routing." (33) Rules thus encourage conformity and discourage new ideas or suggestions. Rules not only discourage new suggestions or new patterns of behavior because of the possibility of getting into trouble, but they also discourage the search for better ways of performing the same tasks. One is generally led by the theoretical literature to conclude that the greater the formalization, the lower the rate of program change. (4, 32, 33, 76)

However, there have been surprisingly few studies of the relationship between formal bureaucratic roles and operating procedures and program change, despite the commonplace observation that bureaucracies, the citadel of rules, are resistant to change. In fact, the level of organizational bureaucracy has been mentioned by many authors as an influence of innovation; the more bureaucratized, the less innovative. (2, 3, 9, 10, 18, 39, 47, 52, 57, 68) Victor Thompson, for example, argues that public agencies are not conducive to innovative behavior. He claims that "a monocratic social structure, a detailed allocation of resources, an extrinsic reward system based on status and power, and a control system designed to suppress conflict--all characteristics of the bureaucracy--collectively tend to reduce the potential for innovative behavior." (67)

Thompson states that "the bureaucratic form has been designed for efficiency and production." It is not surprising, then, that many public agencies have been designed along bureaucratic lines. "The prevailing theory for much of this century, despite compelling evidence to the contrary, has been that policy flows from the top, i.e., generally from elected officials, and that it is the function of most public agencies to execute that policy." Thus, Rowe and Boise claim that "the very conditions which Thompson argues are essential for innovations are those which prevailing theory has led public officials to avoid." (59)

On the other hand, in his book Dynamics of Bureaucracy, Peter Blau declares that

"The widely held belief that members of bureaucratic organizations necessarily resist change rests on the assumption that bureaucratic structures are characterized by a perfect state of equilibrium, which makes any alteration a disturbance. However, no such state of perfect adjustment and adaption was observed in the two agencies studied."(10)

Another disruptive force that writers term a differentiating factor is the distribution of rewards. Stratification of an organization refers to "the differential distribution of rewards to the jobs in an organization and the types of rewards that are differentially allocated to organizational positions are usually money and prestige." Hage and Aiken report that "prestige may take a variety of forms such as title, office size, location of office, type of desk, and so forth... The greater the difference between the top and the bottom, whether the differences are in terms of salaries or prestige, and the harder it is to move from bottom to top, the greater the degree of stratification in the organization... Those who have greater wealth and prestige in an organization are less likely to favor new programs and techniques if the change diminishes the status differences among jobs and occupations." * The authors who have researched this subject found only tacit evidence that the greater the degree of stratification, the lower the rate of program change.(32, 33, 76)

Interpersonal relations is seen as "a broad concept referring to the manner in which individuals in an organization relate to one another during the stress, uncertainty, and conflict stages held to be associated with the perception of a performance gap, the search for new solutions, and the attempted implementation of these solutions.... Good, close, open relationships are held to be conducive to a free flow of information.... Such open channels permit candid discussions of problems and of risks attendant upon adoption of new practices."(33) Widespread participation in decision-making processes is also held to facilitate the integration of individual and organizational objectives during periods of change.(36, 47) Havelock

*Hage and Aiken.

points out that one of the best ways to overcome intra-organizational barriers to knowledge flow is to routinely convene groups of organization members to discuss relevant issues. (33)

Effective communication channels between the organization and technical information sources are mentioned by some authors as being crucial to establishing high degrees of organizational knowledge about relevant innovations. (51, 55, 69) The presence or absence of a technical evaluation unit has been mentioned by one author as a structural variable affecting the propensity for an organization to innovate. (68)

The more the internal incentive structure rewards suggestions for innovations, the more will probably be made. Hage and Aiken point out that "such rewards may include prizes, prestige, ability to share in resulting economies, improved chances of promotion, or even just a sympathetic willingness to listen." (32)

Job rotation is mentioned by Havelock as another way to facilitate knowledge of innovations and their diffusion along subunits of organizations. He declares that "rotation appears to be useful mainly where totally different technical knowledge and skills characterize different subunits." He also suggests that "rotation of members among subunits facilitates an awareness and understanding of the problems facing other departments.... Then, if knowledge from other departments is relevant, it can be provided by the man who is 'on rotation'." (33)

Havelock also contends that "a change of leadership often brings new knowledge and perspectives as well as a commitment to new ways of doing things. This often can lead to a shake-up at all levels in the organization so that the new leader's knowledge and policies can be adopted and adjusted to." (33) It would seem to us, however, that a change of leadership may also provide strong support for the status quo if, for example, a deferential protege replaces a mentor.

Many of the same factors that influence the innovation suggestion rate also influence the rate at which an organization will put suggested changes into practice, but a dilemma exists concerning most of the factors we have mentioned in this section on organization structural factors. James Q. Wilson hypothesizes that "innovative activity is a function of diversity in task structure and incentive system," (75) i.e., a climate similar to that suggested above. He then argues that "the greater the diversity within an organization, the greater the probability that organizational participants will conceive of and propose major

innovations, and the smaller the probability that such proposals will be adopted." This we term "The Wilson Paradox." The reason for the low adoption probability appears to be the difficulty in obtaining a decision in an organization characterized by diversity. Thus, according to Wilson, "the climate required to induce innovative behavior in organizations may be the same climate which will prohibit the implementation of innovative proposals." (75) To the extent that this is true, those whose profession it is to design organizations might be faced in part with choices between climates which induce innovative behavior and others which are needed for favorable decisions on innovative proposals.

Nevertheless, the evidence supporting Wilson's hypothesis is not just anecdotal. Menzel, for example, advises that "the experiences of government agencies, voluntary associations, and business firms tend to confirm the hypothesis he (Wilson) has offered." (47) Sapolsky's studies lead him also to accept Wilson's hypothesis. He found "that diversity in department store task structures, or the autonomy of the control division in accounting matters, facilitated the presentation of innovational proposals. Yet diversity in department store structural arrangements, the decentralization of decision-making authority, and the existence of a large number of equally situated subunits frustrated attempts to implement these proposals." (61)

Regarding the Sapolsky study, "it seems likely that part of the resistance of buyers to the series of innovations under study (e.g., separation of buying and selling functions) was that implementation of these innovations would likely reduce their social and economic position." (47) Nevertheless, this dilemma which we have termed "The Wilson Paradox" permeates much of the literature.

(iii) Factors Concerned with the Organization's Functions and Performance

When an organization is not performing internal tasks and functions as intended, or there are unanticipated negative effects of internal actions, then obviously a performance gap exists. Perhaps the two causes of organizational performance gaps germane to this section of our report are internal technical change and inevitable internal turnover.

New ways of performing tasks may cause profound changes in an organization's behavior rules, structure and goals. For instance, Downs has pointed out that "constant changes in military technology have

caused a continuous reorganization of important parts of the Air Force." It is suggested that "the greater the rate of change in internal technical environment, the higher the innovation suggestion rate, since performance gaps will appear quite frequently." (21)

"Every organization is constantly adjusting its allocation of personnel to organizational roles because its members age, change status, or leave. Even though its formal role structure remains unchanged, these adjustments may cause major changes in the organizational behavior. No two people have exactly the same capabilities, personalities, and friends; hence shifts in role players alter the performance of roles," and subsequently create performance gaps as preludes to change. (21)

Most organizations have a memory and a powerful tendency to continue doing today whatever they did yesterday. The main reason for this inertia is that "established processes represent an enormous previous investment in time, effort, and money. This investment constitutes a sunk cost of tremendous proportion. Years of effort, thousands of decisions (including mistakes), and a wide variety of experiences underlie the behavior patterns it now uses. Moreover, it took a significant investment to get the many members and clients to accept and become habituated to its behavior patterns." (21)

If an organization adopts innovations which change its behavior patterns, it must incur at least some of these costs all over again. Therefore, it should only rationally adopt innovations if their benefits exceed the sum of the benefits derived from existing behavior and the costs of shifting to the new patterns. (11, 21, 33, 68)

Another aspect related to organizational memory of how to do things is its past history regarding innovations. The early studies tended to believe strongly in theories such as "once a leader or follower -- always a leader or follower." (55, 67, 70) Later studies, however, have tended to show that an organization can be a leading innovator in one subject area and a laggard with respect to many others. (28, 47, 76)

Downs has theorized that "an important ingredient determining organizational inertia is the percentage of conservers in an organization and the degree of their dominance. If conservers occupy the most important posts, organizations will strongly resist innovations. If conservers are

numerous but do not occupy key posts, the organization may adopt changes in principle, but its leader will have trouble implementing them." Organizations always exhibit greater inertia regarding their more profound components (such as basic goals or organizational structure) than their shallower components (such as rules or day-to-day behavior patterns).(21)

It should be emphasized that the inertia exhibited by most organizations has many extremely important beneficial effects upon the organizations themselves and society as a whole. "Inertia imparts a measure of stability to social organizations which helps them perform certain vital functions, such as maintaining a pattern of order in social life, and preserving important ethical and cultural values. Such functions are especially significant in modern societies marked by strong pressures toward rapid change emanating from technological innovations. Thus, the fact that inertia often makes innovations extremely difficult is sometimes a virtue.... One of the major forces counteracting inertia, however, is the simple desire of individual officials to do a good job."(21)

Organizations not only need to conserve their resources, but they also must maintain at least a minimal level of morale and loyalty among employees if they are to survive. Hage and Aiken assert that "despite the obviousness of this fact, organizations vary considerably in their attitudes toward their employees' morale and well-being. Some have a humane policy; they are concerned about the welfare of their employees both on and off the job. Some have an exploitative policy; they seem to view their workers as part of the machinery. These different organizational orientations, as reflected in company creed and deed have a considerable impact on job satisfaction."* Job satisfaction can be viewed as a summary measure of numerous aspects associated with the job, including salary, pace of work, freedom of movement, hours, company regulations, and so forth. Salary is usually the first working condition considered, but, however, it would be a mistake to assume that it is the only one or even the most important one. It is generally assumed that high job satisfaction across all jobs in the organization implies an organization with high morale; low job satisfaction implies an organization with low morale.(32, 33, 36)

*Hage and Aiken.

People who are satisfied with their jobs are more committed to the organization; consequently, they are more receptive to new ideas for improving existing products or services. These same people are also likely to be willing to try innovations suggested by others. It could be argued that the contented job occupant will be complacent; instead, job satisfaction really suggests a pride in work which is reflected in the continued effort to improve the quality of work. Hage and Aiken contend that "only if the organization has high morale can it successfully implement the new activity and weather the ensuing organizational stress."

Evidence points to acceptance of the hypothesis that the higher the level of job satisfaction, the higher degree of acceptance for innovations. Hage and Aiken's empirical research revealed that although changes were relatively minor ones, there was still considerable resistance to the changes because of low job satisfaction. "When working conditions were altered by allowing the workers to participate in decisions about the proposed changes, job satisfaction increased and innovations were accepted readily." (32)

Every organization needs demonstration of success in order to justify its existence to the outside world and, perhaps more importantly, to its participating members who like to be part of a winning team. Many organizational members like to believe that their own activities contribute significantly to the accomplishment of organizational objectives. When the organization apparently succeeds in at least partially achieving these objectives, then the members' contributions seem more worthwhile.

Within the broad area of organizational achievement, Hage and Aiken suggest that "there is a fundamental policy distinction that helps to characterize differences between organizations. Some prefer to increase the volume of production as rapidly as market conditions warrant; whereas, others believe that product quality deserves the highest priority."

It has been suggested that when organizational policy emphasizes the speed of production and volume rather than quality and control, decisions are likely to be made that will avoid the kind of interruptions that usually are produced by the introduction of an innovation. In organizational contexts in which there is emphasis on high volume of production, the decision makers are viewed as being less likely to perceive any need for changing the existing arrangements. (32) Our literature search, however, found little evidence to support such a suggestion because apparently researchers have not seen it appropriate to relate these variables in their studies.

The degree of efficiency, on the other hand, has received a considerable amount of attention in the organizational literature. (32, 41, 76) It should be pointed out, however, that this literature almost always defines efficiency in terms of economic costs, but we would add the necessity of also considering quality and relevance. For example, while the measure of efficiency is usually monetary, it can be expressed in terms of other kinds of costs; for example, prisons sometimes report the use of human resources and armies figure the number of casualties in a battle. In general, money represents a summary measure for many other kinds of resources and allows for comparisons across organizations with different specific purposes. (32)

Although all organizations attempt to conserve scarce resources, some are much more concerned about their efficiency than others. Some organization decision makers have an avowed policy of cutting costs per unit of output, while others adopt a much more liberal attitude toward this aspect of performance; instead, they worry about other facets of organizational operations. For example, the organization that is concerned about the quality of its product and/or service, or the contentment of its employees, is not likely to be as concerned about efficiency. A high degree of efficiency implies great organizational efforts to conserve resources or to secure greater output with the same resources; a low degree of efficiency implies the opposite. Efficiency has been referred to as one aspect of "organizational effectiveness" by some researchers. (32, 41, 76)

New programs usually not only represent additional costs of operation, but if they are truly innovations, they also represent unpredictable costs. The actual implementation of change usually reduces the efficiency of an organization because of the disruptions in routine which change implies. Therefore, organizations that are concerned with maximizing efficiency appear to us to be more likely to opt for a continuation of the status quo.

Some innovations are designed actually to increase efficiency. Unfortunately, the fact that they are usually only spending more of one resource in order to save another is sometimes overlooked. (32)

A few authors have theorized, but not proven, that organizations having greater autonomy and independence in their operations tend to be more innovative because they dominate over, rather than are dominated by, their competitors. (21, 22, 67) It seems to us, however, that these same organizations could just as likely be complacent and so satisfied with the status quo that they might not wish to innovate.

Some writers have posited that persons entering the bureau from outside are much more likely to have new ideas and to be unrestrained by even informal considerations. (21, 66, 76) Therefore, it would follow that the higher the personnel turnover in the bureau and the more it tends to fill high-level positions by importing "outsiders" rather than promoting from within, the higher its innovation suggestion rate is likely to be. The only evidence uncovered concerning the testing of this suggestion is that offered by Shepard concerning the implementation of a unit management program in a number of California hospitals, and this appears to us to be inconclusive. (66)

C. Environmental Factors

Environmental factors have been reported by various researchers as having influence on organizational innovations and their diffusion. Many theorists too have given increasing attention to the environment in which an organization functions. Organizations obtain various inputs from their environments, process them, and feed back finished products. At the same time, the surroundings place many demands on these organizations.

Environmental factors can be grouped into (i) Market Related Factors, (ii) Clientele/Community Characteristics and (iii) Other Organizations and Individuals as Factors.

(i) Market Related Factors

Many performance gaps are likely to be externally created, often by a crisis or sudden change in the demand for an organization's products or services. (5, 18, 21, 40, 55, 57, 75) Such gaps tend to appear more frequently and expand faster in organizations dealing with

rapidly changing external environments than in those dealing with relatively stable ones. Consequently, the former must be able to change their behavior quickly, whereas the latter can concentrate their efforts upon performing existing tasks with maximum efficiency. (21, 40, 75)

Changes in technology occurring outside an organization may significantly affect the nature of its functions, and therefore alter its behavior. For example, "the development of branch banking has made it harder for police to prevent robberies." (21) Downs has also suggested "that organizations whose operations are dependent upon innovation-prone technologies are likely to experience more frequent performance gaps than those based on more stable technologies." (21)

Havelock contends that "if competition truly plays a significant role in inducing innovative output, then it may be because it confronts the organization with a crisis, sometimes a crisis of survival. The conservative forces in organizations are often such that they can only be moved by major shocks from the environment which threaten their very existence." (33)

Studies by Mansfield and Utterback on the impact of the economic environment indicate that innovation is a function of the extent of the market and of factor costs, i.e., the frequency of innovation may be expected to increase when the market for a particular product is expanding. Similarly, when the cost of a particular input rises, innovations may be expected to be aimed at reducing the use of that factor in producing an end product. Firms usually tend to innovate in areas where there is a fairly clear short-term potential for profit. Most of the evidence appears to support these contentions. (18, 24, 43, 44, 69)

As far as the market for public goods is concerned, it appears accurate to report that citizen assessment of public services seldom directly stimulates technological change in state and municipal agencies. Menzel, for example, reports that "officials in some functional areas generally regard the public as being unable to evaluate the quality of agency performance, except perhaps by the newness of visible equipment, e.g., fire trucks. Where citizen complaints do occur, they are likely to center on such issues as parking zones or the location of traffic signals. The difficulty in evaluating the activities and services of public agencies

means, for all practical purposes, that it is nearly impossible for the citizenry to judge whether or not an agency is using best practice techniques." (47)

To say that citizen demands do not directly stimulate public agency innovation is not to suggest that public pressure is totally absent. Exceptions, of course, exist. Thus, Menzel points out that "the activity of Joe Linko, who was able to publicize his pictures of road hazards in the New York City area, was the element in dramatizing the need for improved highway design and the installation of safety devices. Also, citizen assessment of the importance of various services may shape the relative affluence of functional fields (through the budgetary process) and thus the differential rate of technological change by field." Direct citizen involvement, however, probably acts more like a "veto" than a stimulant. Indeed, a law of "anticipated reaction" appears to determine the use and acceptance of some techniques. Thus, "the use of high-pressure sodium bulbs has occasionally been retarded by citizen complaints of glare in apartment buildings and by adverse reaction to the color of the light (implying crime prevails in a particular neighborhood)." (47)

Menzel also asserts that "the impact of anticipated reactions seems to work even more effectively when there is a direct relationship between the department and the public it serves. Garbage collection, for example, has long been regarded as immune to new collection methods and techniques. Despite a plethora of studies showing that a one-man rather than a three- or four-man crew and once-a-week, curbside pickups save tax dollars, municipal officials in many cities are loath to change for fear of adverse citizen reaction." (47) Elected and appointed officials tend to tread lightly in such areas. (68)

(ii) Clientele/Community Characteristics

In a rapidly changing environment, for example, a public agency in a rapidly growing community, expectations usually increase faster than the services offered and demands for services outrun the public's ability to pay for them. "A more heterogeneous environment with a varied clientele demands diverse services, so there is greater competition for scarce resources from the more fragmented socioeconomic and demographic forces." (4) We have previously noted that increased uncertainty and diversity often encourage the adoption of innovations. The character of the client population served thus determines the demand for services, the scope of activities, and the human resources to be

utilized by an organization. Similarly, since many inputs in the exchange relationship may be resolved financially, the community's wealth is reported by some authors as an important environmental variable. (4, 28, 70) Just how important, however, seems to be an issue. Usually in high cost innovations one can expect it to be more important than in low-cost situations. Baldrige and Burnham found community wealth (per capita income) little use in explaining the variations in adoption of educational innovations in San Francisco Bay Area Schools. (4)

With respect to legislative innovations, Gray found that the first ten states to adopt any particular law were usually wealthier than the nationwide average in the year of adoption. (28) Walker found a strong positive correlation between average income and his "legislation innovation score" in three time periods. (70) Walker's conclusions were that "there is evidence that the larger, wealthier, more industrialized states adopt new programs somewhat more rapidly than their smaller, less well-developed neighbors." He reported fairly strong statistical relationships between his composite innovation score (based on 88 different programs) and the value added by manufacturing, the average per acre value of farms, and the size of the urban population. (70)

Nowhere have the various explanations of community innovation per se been brought together. In part this lack of theoretical integration is due to diverse concepts, since what we have been calling innovation has been variously called community decision making, community decision outcomes, and policy outputs. Nevertheless, Aiken and Alford suggest that "one can hypothesize about such community characteristics as wealth (as we already have), political culture, concentration or diffusion of community power, centralization of formal political structure, community differentiation and continuity, and community integration." (1)

Related to political culture, for instance, cities with majorities holding "public-regarding" values are hypothesized to be more innovative with respect to policies benefiting the community as a whole than cities dominated by groups with "private-regarding" values. (1, 75) The evidence for this, however, is very weak.

Aiken and Alford suggest that "there are three aspects of the argument concerning the concentration or diffusion of community power: concentration of systemic power, diffusion of power through mass citizen participation, and centralization of elite power." (1) They and others contend that the

greater the concentration of power, the greater the degree of innovation. Conversely, the greater the diffusion of power, the lower the degree of innovation. (1, 15, 19) Cities with centralized administrative arrangements and a strong mayor, that is, cities with city manager or partisan mayor-council governmental structures, are hypothesized to be more innovative. (19)

Larger and older cities have been hypothesized to be more bureaucratic and consequently less receptive to policy innovations, suggesting that younger and smaller cities should exhibit higher policy innovation. (1)

It has also been suggested that cities in which community integration breaks down or is extremely low have a lower probability of innovation or other collective actions. Consequently, innovation should be highest in integrated communities. (16)

Aiken and Alford have perhaps conducted the most comprehensive testing of the factors we have mentioned in regard to community innovation, and they report that few of the hypothesized relationships discussed here were borne out. Their major findings thus far have been that "older and larger cities, with residents of lower levels of education and income, fewer managers and officials, higher voting turnout and Democratic voting, a lower degree of in-migration, and higher unemployment levels have participated more in public housing, entered it faster, and have higher performance levels." (1)

The data gathered by Aiken and Alford further show that "cities with city-manager governments, nonpartisan elections, at large elections, and small city councils are either less likely to innovate in this public policy area (housing) than cities with mayor-council governments, partisan elections, ward elections, and large city councils, or there is no relationship." (1)

Despite the fact that Gray found that the first ten states to adopt a particular law were usually politically competitive (29), Walker and Menzel have not found this to be the case. (47, 71)

Most findings, largely influenced by Aiken and Alford's work, point to three kinds of concepts as the most important: the quality and stability of interorganizational ties, the accumulation of experience and information in a community system (continuity), and structural differentiation. Interorganizational networks are conceived as "properties of community systems that are developed historically through the experience of organizational units and their leaders with each other.

If the population of a community is relatively stable, these inter-organizational networks are not likely to be disrupted by the continuous influx of new citizens and organizations, and thus there is the greater potential for increasing their capacity for coordination over time."(1)

The degree of historical continuity in a community structure--especially as it affects interorganizational networks--seems to influence innovation. Presumably older cities have had a longer time to work out patterns of organizational interactions, alliances, factions, or coalitions. "In such communities the state of knowledge in the community system about the orientations, needs, and probably reactions to varying proposals for community action is likely to be quite high, thus increasing the probability of developing a sufficiently high level of coordination in order to implement successfully a community innovation."(1)

Aiken and Alford conclude that the degree of structural differentiation and complexity of a community may also influence innovation for two reasons. First, "larger cities are likely to have more organizations devoted to specific kinds of decision areas--i.e., more likely to have a redevelopment agency, a housing agency, a community action agency, a city development agency for model cities, welfare councils, and other community decision organizations.... Such organizations are likely to have larger, more specialized, and more professionalized staffs to provide the technical, administrative, and political knowledge required to innovate successfully not only within their organizations, but also in those areas which require activating interorganizational relationships and establishing critical coalitions.... Secondly, it is precisely in the larger, more structurally differentiated communities that coalitions that can implement an innovation will be easiest to establish." If it is assumed that all organizational units in a community do not have to be mobilized in most public decisions, but rather that a limited number of organizational units can suffice to bring about a successful innovation, then it follows according to Aiken and Alford "that in large, highly differentiated communities a lower proportion of organizations will participate in such decisions, and that there will be wider latitude in selecting organizations for these critical coalitions. The more highly differentiated or specialized a community system, the higher the proportion of decisions that are likely to be made by subsystems and the less likely the entire system will be activated."(1)

(iii) Other Organizations and Individuals as Factors

Much information and transference of innovation occurs as a direct result of the interaction between organizations. The more interaction among users and potential users of a tool or technique, the more likelihood there is for its subsequent diffusion. (33, 35, 46, 47, 73) The more one organization knows about how an innovation has fared in other like environments, the less risk is involved for the adopter. (19, 46, 70)

Jack Walker asserts that state officials make most of their decisions by analogy. The rule of thumb they employ might be formally stated as follows: "look for an analogy between the situation you are dealing with and some other situation, perhaps in some other state, where the problem has been successfully resolved." (70) He also argues that "a process of competition and emulation or cuetaking is an important phenomenon which determines in large part the pace and direction of social and political change in the American states." (71)

The more recent works of Gray and Menzel (28, 47) have produced evidence contradictory to Walker's claim that a continuum exists along which states are distributed from those which are usually quick to accept innovations to those which are typically reluctant to do so. (70) "Innovativeness is probably not a pervasive factor, rather, it is issue and time-specific at best." (28) It still appears valid, however, to accept Walker's contention that the likelihood of a state adopting a new program is higher if other states have already adopted the idea. The likelihood may be stronger if the specific innovation has been adopted by a state viewed by key decision makers as a point of legitimate comparison.

Inter-organizational and inter-personal communications are also important factors in the diffusion process. An organization's peer groups or competition can obviously affect its operations. (19, 56) If its competitors alter the quantity, quality or price of their services or products, then the organization will usually take compensatory action to sustain itself at least at its current level. If a competitor adopts a new tool or technique, then the organization has to consider similar adoption. If the organization itself is a leader, then it will often test new techniques just in order to keep its edge on its competitors. (44, 45)

Havelock contends that "social theorists have claimed that competition breeds innovation in a continuing cycle benefiting all of society, but in practice this has often not been the case. Only open competition based upon objective comparative quality ratings can induce organizations to improve their output, but most usually find such a blunt confrontation far too risky and uncomfortable to be tolerable. Economic history is full of examples of commercial organizations merging, fixing prices, etc., in order to avoid true competition."(33)

"Rarely has attention been paid to the activities of suppliers as an independent variable affecting the diffusion of innovations among a potential set of adopters. The most notable exception to this pattern is some of the work in geography, where one of the hypothesized explanations for the existence of diffusion down through the urban size hierarchy is the tendency of manufacturers to begin their activities in the largest potential markets (which for many cases would be correlated with population)."(47)

Feller et al have reported in detail how the activities of suppliers can exert an independent influence both on the extent of adoption of specific techniques and on the identification of actual adopters in the following ways:

(a) Marketing strategy. "Firms differ in the extent to which they promote new techniques. Some firms actively promote new products by advertising, field demonstrations, sales representations, and technical courses for potential adopters. Others apparently develop a new product, advertise it, and they rely upon the market to respond. Interestingly, both strategies can rest upon the existence of a demonstration effect among potential customers to spread the word of the value of the new product. In the one case, however, a manufacturer may direct its initial sales efforts at the 'one percent innovators' among the potential clientele, that is, that group of potential customers which by past contact or by professional reputation are regarded by the manufacturer as most likely to be receptive to a 'better product.' Given acceptance by this group, the manufacturer seeks to convert the presumed favorable reaction of this group into a stimulus to the rest of the group. The other approach is more passive. It is almost as much a matter of taking orders as of active promotion."

(b) "How a firm allocates its sales effort by city size or region may also affect the observed pattern of adoption. That is, one might expect adoption of a given technique to be higher among groups that have been contacted by a sales representative than in cities which have not been contacted. There are numerous channels through which firms market their techniques so that it is not possible to say with any degree of certainty that one form of distribution is more effective in promoting adoption than another. However, researchers have found 'marketing' backwaters, where, either as a function of city size or distance from major distribution points, agencies have not been approached by manufacturers. Moreover, marketing efforts do appear to be correlated with other plausible predictors or receptivity to new techniques. We have little data on this point as, indeed, few firms seem to have formal marketing allocation algorithms, but the number of salesmen in a region seems to be related through an iterative process to past and projected sales.... There also appears to be a pronounced geographical influence on adoption which is traceable to the number and location of firms in the industry. Some multi-product firms sell through national networks. For other technologies, firms appear to have discernible geographic areas-of-market control. In still other cases, particularly for firms entering the public sector market, the technique appears to spread outward in a form of contagious diffusion from the manufacturer's locale, with allowances made for spatially discontinuous jumps to distant major markets (e.g., for example, one-man garbage collection vehicles appear to be diffusing eastward from California)."

(c) "The number of firms which are potential suppliers of a technique may also exercise an independent influence on the receptivity of state or city governments. The general purchasing procedures in these jurisdictions are for the functional agency to determine its technological requirements, to set out the purchase specifications, and for a separate purchasing department to issue requests for bids on these specifications. Competitive bidding is typically required.... When there is only one supplier, as is the case in a number of these technologies in the public sector, an agency can secure a waiver of the competitive bid requirement. But there does appear to be somewhat of a hesitancy on the part of some agencies to request waivers, at least as frequently as might be required, given the possible number of sole source suppliers of new techniques.... Two factors appear

to shape this hesitancy: the view that the existence of a monopolistic supplier is *prima facie* indication that the price is too high, and that the best agency strategy is to wait until additional suppliers of equivalent techniques appear and drive down the product price; and concern that too frequent use of sole source contracts will make the agency vulnerable to the charge of favoritism.... On the other hand, too large a number of suppliers creates a situation in which agencies have considerable difficulty in keeping pace with the characteristics of the technology, with the reliability of the techniques offered by specific manufacturers, and with the reliability of the promised services of the manufacturer. Such a situation may tend to make agencies more cautious in their adoption of technologies, and thus generate a slower observed rate of adoption."(47)

Obviously, somewhere between the one and too-many-firms exists an "optimal" number of firms. Feller et al have little idea what this number might be. Rather they are suggesting that the number of firms itself is a variable.

Technological innovation often appears to have been produced by a continuation of a dominant outside organization, competent receptive boundary personnel in the host organization, and functional interdependence and channels for communication to take place.(17)

It now appears to be generally accepted that new ideas travel through a social structure via both mass media and personal influence.(19) Coleman, Katz and Menzel (among many) were able to show that physicians, despite their professional training, did not make decisions about new drugs on the basis of technical literature alone, but turned to other physicians for both information and social support.(16)

The most important point about personal influence appears to be that made by Everett Rogers, who found that it is more important at certain stages in the adoption process than at others.(55) For example, personal sources are not available to earlier adopters, as their relatives, friends, and neighbors are unlikely to have experience with the practice at the time of the innovator's adoption decision. Personal influence appears to be more important in the decision process of late adopters, who also utilize a different type of personal influence (friends, relatives and neighbors), than do the earlier adopters who use agency personal sources.(56)

Intercity influence was studied by Crain in his examination of the diffusion of fluoridation among American cities, and he, like Rogers, found that such influence played different roles at different times in the process depending upon whether it was an early or late adoption. (19)

For successful innovations transfers of information appear to occur more often through discussion and personal contact at each stage than through other means. One mechanism through which boundary transfers occur is a special case of the "two-step flow" of communication, i.e., someone within the firm who is able to communicate both with the technical information sources outside the firm and with end users of information within the firm serves as a key communication link. A second mechanism for transfer is the migration of personnel across boundaries. This includes migration into the firm from competitors' and customers' organizations, from universities, and from other information sources; migration from the firm in terms of "spin offs" of new ventures; and transfers between the divisions of larger firms. (69) Consulting relationships may be a special case of both of these forms of transfer. "Apparently, idea generation and effectiveness in innovation is increased, other factors being equal, both through the use of outside consultants and through outside consultation and technical work by members of the firm." (47)

Knowledge entry can also be facilitated through the actions of an outside agent. (33, 47) An outside person or group may perceive a need for new knowledge and also take on the responsibility of bringing this knowledge to the organization.

"Many new information networks have been established by organizations such as the Council of State Governments, the Federal Commission on Intergovernmental Relations and the Citizen's Conference on State Legislatures, whose primary function is to improve communications among the states. Other public interest groups such as the International City Management Association, National League of Cities, U.S. Conference of Mayors and the National Association of Regional Councils, among others, operate as sources of information and policy cues. By organizing conferences or publishing newsletters they bring together officials from all over the country and facilitate the exchange of ideas and knowledge, thus increasing the officials' awareness of the latest developments in their field." (47)

Note that the role of public interest groups as change-agents in the public sector will be taken up again in Section IV of this report.

A final factor seen by many as being important in the diffusion process is the Federal Government. Obviously legislation must be heeded, and Gray has shown that program adoptions tied to Federal grants-in-aid diverge from the pattern of normality exhibited by programs adopted independently by states. "With respect to state merit systems covering welfare, for instance, only nine states had such coverage before the Social Security Act was passed. After its passage 32 states decided to place employees under a merit plan. Following the Social Security Board's successful fight to make merit plans a requirement, the remaining seven states followed suit." (28)

It can be hypothesized that Federal and state legislatures in turn have considerable impact upon the innovation adoptions of both private and public organizations. Their specific impact upon public agencies will also be dealt with in Section IV.

D. Innovation Specific Factors

Many factors influencing the acceptance or diffusion of an innovation can best be described as being specifically relevant for that innovation. Our literature search has discovered many such factors that can be categorized as innovation specific. Under this rubric we have clustered the factors into two groups--(i) Factors relevant for costs and benefits and (ii) Factors directly concerned with extra-organizational influence.

(i) Factors Relevant For Costs and Benefits

It is to be hoped that before any organization or individual decides to accept a change, the costs of that change will be compared to its benefits. "Both organizations and individuals are reluctant to accept any change in their environments -- whether good or bad -- as permanent if such acceptance would require them to make a significant alteration in their customary behavior patterns. It is usually more rational for them to continue these behavior patterns while conducting an intensive search to see whether the old status quo ante will return." (21) One important factor in influencing the acceptance of a new tool, technique or structural change is just how beneficial the new innovation is likely to be for them. In order to decide this on a rational basis, some sort of cost-benefit analysis is needed, no matter how primitive. Our literature search did provide us with some information on the importance of costs, but little about benefits.

The costs of adopting a new idea and putting it into operation have frequently been mentioned as obstacles to rapid adoption, usually with at least an implicit "other things being equal" assumption involved in the discussion. (23, 26) Although contradictory evidence has occasionally surfaced (47), the initial cost still is considered by most authors to be an influential factor in the adoption of an innovation.

In addition to initial costs, other factors such as recurring (maintenance) costs, rapidity of cost recovery and regularity of financial return have been found to be positively related to rate of adoption. (23, 26) The latter-mentioned costs are all relevant for determining an innovation's profitability, and Mansfield, for example, hypothesized that the rate of adoption (he calls it the rate of imitation) "is a linear function of the profitability of employing the innovation, the size of the investment required to use it, and other unspecified variables." (43) As we have mentioned, various testings of his model have provided strong support for the hypothesis: other things being equal, the more profitable the innovation or the smaller the required investment, the greater the rate of imitation. (12, 23, 26)

Another direct financial expense pointed out in the literature is the cost of changing from an old to a new technique. This cost may be so great that it is more economic, from the social point of view as well as the private, to go on using old equipment. The cost of continuing with existing tools or techniques may indeed be less than with advanced replacements that require the formation of new equipment items and skills.

The rate of imitation of an innovation is usually slow, often because the quality of new types of equipment tends to improve with the passage of time. The equipment is "debugged," and then its price tends to be reduced. Brozen points out that "new techniques are often uneconomic, then, for many uses after they first appear but become economic after further development." (12)

Not all costs, however, are quantifiable. The "sunk costs" of established behavior patterns, for instance, also influence a decision-maker's reaction to unexpected rises in his utility income. "Rather than immediately changing his behavior patterns to suit the new higher level, he will usually wait to see whether the change is likely to last and if it is large enough to offset the costs of shifting those

patterns." In essence, the "sunk costs" embodied in his structure of behavior patterns constitute a "memory" which links his past behavior to his present actions. "This link between past and present not only influences his search behavior, but also causes a lag in his adjusting what he regards as the satisfactory level of utility income to the levels he is actually experiencing." (21) In basic economic terms the greater the "sunk costs" that must be duplicated or replaced by an innovation, the greater the incentive to avoid that innovation.

Often cost-benefit analysts will exclude "sunk costs" from their calculations because of their irrelevance for present discounted value comparisons, but we feel that, because these costs undoubtedly act as both organizational and individual barriers to innovation, they should be included in our literature summary.

The literature usually describes organizations as having many levels of structural depth. The shallowest are the specific actions taken by the organization, slightly deeper are the decision-making rules being used, deeper still are the institutional structures used by the organization to make those rules, and deepest of all are the general purposes of the organization. (21)

Some changes, even though hardly quantifiable, are more costly than others. In particular, "changes that include the deepest layers in an individual's or organization's goal structure are more costly than those involving superficial layers." (21) Such non-quantifiable costs, it should be pointed out, may vary from person to person and from organization to organization. "For some individuals, maintaining their present family standard of living is rated as more important than maintaining a particular job. For some organizations maintaining a reputable public image may be more important than democratic decision-making structures." (32) Nevertheless, such factors should be evaluated as much as possible before any innovation is adopted by an organization.

In connection with the depth of organizational and individual change, Knight points out that "less radical changes are more likely to be adopted, especially if they only affect a few persons." (38) Wilson suggests that "the lesser the amount of organizational space affected, the greater the chances for adoption." (75)

Self-interest, as we have mentioned in our section on individual factors, motivates people in organizations to oppose any changes that cause net reductions in things personally valued by them. For

example, greater resistance can be expected if an innovation creates large threats to job security, power and prestige, than if it were to enhance the value of things. There is some evidence in the literature to support these contentions. (11, 68)

The political risk involved as a cost of failure is sometimes judged to be greater than the gain from an innovation. In New York City, for example, the officials were ready to abandon "slippery" water, even after being shown its advantages, whenever the chances for success appeared to be something less than 100 percent. (68) It can therefore be suggested that the greater the political risks involved (vested interests affected) the lower are the chances of adoption for a specific innovation. (18, 47, 68)

We found virtually nothing in the literature concerned with the importance of benefits. The few articles dealing with profitability implied that the greater the excess of benefits over costs, the easier would be acceptance of an innovation, provided that budget constraints were not exceeded. (12, 23, 26) It would appear to us, that in addition to the magnitude of benefits, possible adopters should be aware of the distribution of benefits over time (as well as the costs over time) and who will receive the benefits, compared to who pays for them.

Before leaving the subject of factors relevant to costs and benefits, we think it worth noting that Rogers and Shoemaker have suggested several characteristics of innovations, as sensed by the receivers, which contribute to their differential rate of adoption. These characteristics are (a) Relative Advantage, (b) Compatibility, (c) Complexity, (d) Trialability and (e) Observability and also warrant consideration in any attempt to evaluate costs versus benefits. (57)

(a) "Relative advantage is the degree to which an innovation is perceived as better than the idea it supercedes. It may be measured in economic terms, but often social prestige factors, convenience and satisfaction are important components as well. 'Objective' advantage matters little; what does appear to matter is whether the individual or organization perceives an innovation as being advantageous. The greater the perceived relative advantage of an innovation, the more rapid its adoption rate is likely to be." Most of the literature mentioned earlier that is concerned with profitability appears to support Rogers and Shoemaker on this matter.

(b) "Compatibility refers to the amount of congruence and similarity between an innovation and an existing thing or idea which has traditionally served that purpose which would be replaced by the innovation. Some innovations become substitutes for existing elements, although others often become new additions to an existing stock. It seems likely, however, that in most cases an innovation will be compared with an existing idea which it may eventually supplement, complement, or replace. The degree of similarity between an innovation and its traditional counterpart is at issue here, and it is hypothesized that compatibility and rate of adoption will be positively associated." (68) While Rogers and Shoemaker found this positive association, others have found it not to be an important factor particularly with respect to various agricultural innovations. (9, 15)

(c) "Complexity is the degree to which an innovation is perceived as difficult to comprehend and use. Some innovations are easily understood by most potential adopters, while others are not and consequently will be adopted more slowly. In general those new ideas requiring little additional learning investment on the part of the receiver will be accepted earlier than ideas requiring much learning investment." Information is costly. The research of Fliegel and Kivlin supports this suggestion. (26)

(d) "Trialability refers directly to minimization of risk involved in adopting innovations." This attribute has frequently been mentioned as an important factor in the diffusion process. (9, 15, 55, 57, 66) The possibility of trying out an innovation on a small scale prior to full adoption has direct economic implications, but is also of interest in the sense of minimizing possible unanticipated consequences, non-economic as well as economic. Evidence appears strongly to support these contentions. Fliegel and Kivlin found this attribute to be an important factor in encouraging rapid adoption of thirty-three modern farm practices. (26) Sherman found that "the implementation of a successful Unit Management Program in California hospitals is more likely if the solution and decisions are developed, tested and found credible for solving problems on a small scale before an attempt is made to widen their scope." (66)

(e) "Observability is the degree to which the results of an innovation are visible to others. The easier it is for an individual to see the results of an innovation, the more likely he is to adopt." Rogers and Shoemaker report that "a rat poison that killed rats in their holes diffused very slowly among farmers in the United States because its results were not visible."(57)

(ii) Factors Directly Concerned with Extra-Organizational Influences

Some evidence has previously been presented showing that chances for the adoption of an innovation are increased the more interaction an organization has with other users or early adopters. (47, 73)

An innovation about which a potential adopter is aware stands a much better chance of acceptance than one about which information is severely lacking. (33, 36, 37, 46, 70) The more information concerning the innovation is diffused, the greater the likelihood for successful diffusion of the innovation. (48)

A high level of knowledge of where to look for assistance outside of the organization has been shown to be positively correlated with adoption (42), as has the availability of performance cost data provided by previous users or intermediating change-agents. (68) Feller et al have pointed out that "new products, for instance, with uncertain or conflicting performance and cost claims, often lose out as the city purchaser or decision maker sticks with the known.... Except in the most haphazard manner, no one is telling the cities what has worked elsewhere--or just as important, not worked.... Scottsdale floundered around with the wrong kind of plastic, for instance, in its first attempt to build a new trash container. City officials become disillusioned when costs of procuring, operating, and maintaining new equipment soar above that of the old equipment."*

Rogers et al have reported that extra-organizational personal influence is more important at certain stages in the adoption process than at other stages. (55, 56, 57) More specifically, impersonal sources (media) were found to be more important at the awareness stage. At the

information, application, and trial stages personal sources were more important. Personal sources were especially important at the application and trial stages. Such findings help to emphasize that personal influence appears to be most important at the stage when the decision to try out the new tool, technique or process is being made and in the implementation of the trial decision. (56)

Rogers et al also report that "personal sources of information are used to a greater degree by later adopters." These later adopters are more dependent upon friends, neighbors, and relatives, etc., as information sources than are earlier adopters who use county agents, soil conservation service techniques, etc., to provide them with their information on new farming techniques. (56, 57)

Still another variable that bears upon the effectiveness of a change-agent with regard to a specific innovation is that of the personal and organizational relationship existing between the potential adopters. The better the relationship, the more chance that innovation has to be adopted and subsequently diffused. (5, 46, 70)

In actual numbers, the supporters of a new idea need not actually be a majority or even approximate it. They need only give the impression that they are, or must inevitably become, the majority. Barnett declares that "their advocacy is strengthened by their making it seem that opposition to their idea is futile, unreasonable, or stubborn." (5)

In conclusion, we wish to point out that many innovations have no political constituency and might or might not be relevant to the needs of the adopting agency. For instance, there have been many efforts in recent years to transfer space-age technology and other scientific and technological innovations to meet, and hopefully solve, the needs of state and local governments. But, when they have been appropriate, the problem with many innovations is that they do little to re-elect politicians. Maher, for example, has pointed out that "few innovations have an effective constituency in state and local governments." (42)

IV. INNOVATIONS IN PUBLIC BUREAUCRACIES

Most of the theoretical literature on innovation is concerned with private organizations, but much of this appears applicable to public agencies. Menzel has suggested that "the differences in innovativeness between public and private organizations can be related to factors which differentiate public and private organizations." (47)

Over the last two decades especially, state and local governments have found themselves subjected to a sharp and continued rise in demand for their services. And Bingham* points out that "all this has taken place while employee strikes and public unions have emerged on the scene." It would seem accurate to accept that many local and state service agencies have been confronted with a performance gap that has called for new responses. Almost all of the new research empirically examining innovations in the public sector, however, is concerned with technological innovations.

Nevertheless, we did discover innovation in the public sector that had not been noted in the literature on the private sector. We also found some innovation in the public sector despite the greater rigidity usually assumed to characterize it. It appears that changes in the public sector can be internally and externally motivated, especially by the Federal Government as well as commercial and non-commercial change agents. We will concentrate on the Federal influence and intergovernmental relations in the concluding part of this section.

A. Public/Private Dichotomy

The large body of literature on theories of organizational innovation has been derived from the behavior of "private sector" entities, that is, firms operating within a market environment. Feller et al** suggest that "it might be argued that this private/public dichotomy vitiates the transferability of the accompanying set of theories of organizational innovation." After our review of the theoretical and empirical literature concerning organizational innovation, however, we conclude that if there is a

*Richard D. Bingham, The Adoption of Innovation By Local Government; Office of Urban Research, Marquette University, Milwaukee, Wisconsin, November 1974; for a detailed annotation of this work see Appendix A(v).

**Feller, Menzel and Engel.

difference in innovativeness between public and private organizations, then we too would expect it to be related to factors which differentiate public and private organizations. Among the most salient differences that have been identified are the following:

- Public sector outputs are not evaluated in an external market, which makes it more difficult to develop objective performance measures and to specify goals and functions operationally; consequently performance gaps are less obvious. It is more difficult to trace the relationship between funding and consumption of public sector outputs; public enterprise is also largely exempt from the negative sanction of financial losses which usually occur in private business through failure to adapt to changed conditions or inability to seize new opportunities. In other words, public bureaucracies are virtually free of market constraints; they receive few rewards for successful innovation and few penalties for failure to adapt to a changing environment. Indeed, "innovation is often irrational for members of public bureaucracies, since it usually leads to dislocation within the organization." (32)
- Instead of the reward system of the market, there is a different mechanism of rewards and punishments that places a premium on risk avoidance. The existence of job security and the absence of the profit motive mean that the "consumers" of the bureaucratic services have fewer sanctions than their counterparts in the private marketplace. In some cases, however, the public does possess limited sanctions--through its voting in elections. Bureaucratic change is often also likely to take a long time, when many improvements to be effective need short time implementation schedules. "Bureaucrats are usually motivated by a desire to go along and to get along with their associates and to proceed up the administrative hierarchy; thus their peers and administrative superiors usually become significant reference groups for them." (67)
- Recruitment into bureaucracies and civil service jobs of persons with high risk avoidance reduces the likelihood of innovation in such organizations. Providing a similar barrier is "the usual socialization of new recruits by socializing agents who themselves have little interest in initiating change because of their own vested interests in existing procedures and operations." (67)
- The number of layers of accountability that intervene between a taxpayer as a funder of public services and that same person as a consumer of any of those services is undoubtedly large, thereby making it extremely difficult for a person to realistically appraise

the effectiveness or efficiency of the situation. Regarding equity, it is also difficult for the person to know who is paying the costs and who is getting the benefits.

- The avoidance of controversy, the incrementalism of budgetary procedures and the differences in practice between what was intended by legislatures and that which is the result of bureaucratic implementation are also relevant when considering public/private differences.

There appears little reason to believe that the individual, organizational, or environmental attributes associated with organizational innovation are particularly sensitive to the public-private dichotomy but there is little direct empirical evidence on this point. Much of the literature, however, informs us that "performance gap," "interaction," and "communications networks," for example, are obviously part of the diffusion process in the public sector. (25, 28, 34, 39, 47, 51, 70, 71, 72) "Indeed, to the extent that the public/private dichotomy has relevance for the innovative behavior of such organizations, the differences may not be in terms of their internal characteristics but rather in the nature of their external environments (market/nonmarket) or in the interrelationships between the external environment and their internal characteristics. Here, again, a major theoretical gap exists in theories of organizational innovation regardless of the special form of the external environment." (47)

B. Changes in the Public Sector

As mentioned earlier, the last twenty years have seen a sharp rise in the demand for public services and have presented most state and local governments with an objective performance gap. The usual response to the rising demands has been to increase the size and coverage of government services. Bingham finds "one of the most obvious factors on the state and local government scene has been the rapid growth of local services--e.g., police per capita and school expenditures per pupil, etc. Since resources are not infinite, however, and since service costs have also been rising, continued expansion of such services has become difficult to sustain." In the recent case of New York City, for example, the budgets for services finally outdistanced its revenue and credit sources to such an extent that the city government came face to face with the possibility of bankruptcy. Many cities are searching for ways of reducing their budgets or holding them close to previous levels without affecting services. Some have considered technological innovations, while others have tried managerial innovations such as program budgeting in local agencies or the use of well-defined techniques of program evaluation.

The 1960s were years of great expectations of the need for and possibilities of transferring technology from the space and defense efforts to the civilian sector. "Operation Breakthrough, the California Aerospace venture, the Bay Area Rapid Transit System, and the West Virginia Personal Transit System all indicate that the record to date is a mixed one."⁽⁵³⁾ Nevertheless, the prevailing assumption still seems to be that "if new technologies were not accepted by state and local agencies, this occurrence was due to environmental or organizational factors which made such agencies particularly resistant to new ideas. The possibility that the new technologies were ill-suited to the needs of these agencies, that is, that they did not represent an efficient alternative to existing practices even when the product was nominally designed in response to 'user' needs, does not seem to have gained as much prominence as the laments of firms which have been unsuccessful in penetrating the civilian market. Moreover, the height of any particular market (say, the oft-cited 'fragmentation' of the public sector) may reflect the experience of a single set of manufacturers (say, high-technology firms accustomed to dealing with a single customer, the Federal Government) rather than a uniquely distinguished feature of the public sector."^{*} Clearly, products are developed for and sold in the public sector. Indeed, with regard to Feller et al's analysis, "the lack of any ascertainable resistance to impact attenuators in highway departments as a new product seems based, in part, upon the attitude of highway officials that these devices were merely another new product in a constant stream of new techniques to which they were exposed."

In much of the current discussion of "public technology," one finds reference to the "struggle" to bring technology to state and local governments and also to the apparent impediments to innovations provided by the behavior of public officials. In much of this discussion it is generally assumed that the increased application of technology can contribute substantially to improvement of state and municipal governmental services, and that many of the defining characteristics of these governments make them inherently unreceptive to new technologies. (3, 10, 18, 23, 25, 39, 47, 51, 65, 67)

The internal characteristics frequently found in public agencies are those derived from the bureaucratic model of organizations. Victor Thompson, for example, argues that these are exactly the characteristics which are least suited for innovative behavior. A monocratic social structure, a

*Feller, Menzel and Engel.

productive ideology, a detailed allocation of resources, an extrinsic reward system based on status and power, and a control system designed to suppress conflict--all characteristics of the bureaucracy--collectively tend to reduce the potential for innovative behavior. (67)

Hayes and Rasmussen blame rigid civil service systems for the lack of technical innovation in state and local government organizations. In summary, they have succinctly described the overall climate for innovation in these governments as follows:

"All in all, our state and local governments are superbly equipped to do tomorrow what they did yesterday. But these governments are not designed to be highly efficient, responsive, flexible, or innovative. Any effort in this direction must run against the momentum of the system. . . . This government structure has little surplus energy to devote to change and innovation. . . . Typically, there is little capacity to design new programs, or to put them actually into effect. New programs and new ideas move slowly and fitfully in a climate that is essentially hostile and alien to them." (34)

In a comparative sense, most writers assume that the responsiveness of public officials to new technologies is significantly different--that is, later, slower, and less extensive--than that evidenced by private-sector decision makers when they are confronted with comparable situations. Thus, Myers writes: "Those having a low propensity to innovate tend to dominate government bureaucracies, with the result that the latter tend to ignore or to resist innovations for a long time even after they have been successfully demonstrated elsewhere." (52) Archibald and Hoffman argue that public bureaucracies are far more "likely to foster pessimistic attitudes toward innovation" than private enterprise bureaucracies because the latter exist in relatively competitive environments which generate symmetrical reward systems for risk-taking: "The penalty for not taking positive action may be more severe than the penalty for taking an action that had possibilities but was unsuccessful." (3)

The composite picture that emerges from the recent literature on the use of technology in state and municipal governments can be summarized in the following manner:

- For many basic governmental services, state and local municipal agencies are using tools and techniques largely unchanged for decades.
- When newer, and superior, replacements have appeared, state and local municipal agencies have not usually adopted them, although in fairness it should be noted that they often did not have the funds or skills available to adopt them. This has created a wide variation

in tools and techniques, etc., being utilized by states and cities and substantial differences in input requirements for given levels of service. (68)

Discouraged by the traditional "laggardness" of state and municipal governments in responding to technological innovations and the high costs of aggregating what is otherwise a fragmented market, it seems that "suppliers have had little incentive to invest in research and development to provide new techniques for use in the public sector. The result is that established firms continue to concentrate on staple items with perhaps some incremental improvements, while potential new entrants, especially those seeking to transfer far more advanced and potentially far-reaching techniques, find themselves frustrated by a series of experiences unlike those they had encountered in developing and marketing products for the private sector." (47)

Two different themes have emerged as the usual organizing concepts of the conferences and workshops out of which most of the current perceptions of barriers to change in the public sector have arisen: productivity change in the public sector and technological change in the public sector. (47) These two concepts are undoubtedly related but, nevertheless, different.

Productivity relates to the relationship between inputs and outputs, measured most commonly in terms of output per man-hour or in terms of total factor indices. The need to increase the productivity of state and local governments has been a much quoted theme in discussions concerning intergovernmental roles within the Federal system. "Increases in productivity (that is, increases in the output of goods and services per quantity of inputs) are usually held to be a means by which state and local governments can escape the fiscal pressures arising from steadily rising expenditures and less rapidly rising revenues." (47)

Technological change refers to the adoption of a new set of techniques and appears to be only one way in which public agencies can increase their productivity. A broader concept than technological change is productivity change: that is, it can be generated by adjustments other than the adoption of new "hardware." For example, policemen can be replaced with civilians in administrative tasks, or manpower assignments for garbage collection can be rescheduled. "Indeed," Feller claims, "not denying the potential contributions of slippery water, fire axes, or energy recycling garbage incineration systems, it appears that the major success stories in increasing

productivity, at least in municipal governments, have come more from application of cost-effectiveness analysis than from technical change." * The work of the New York City Rand Institute, for example, has been described by Hayes and Rasmussen as follows:

"With the partial exception of economic studies, these research techniques (operations research, queuing models, simulation, etc.) (are) typically addressed to problems of efficiency: they seek to maximize some value at a given cost or other resource input, or to minimize cost while holding output steady. Probably two-thirds of the Institute's work is of this character. But its most important efforts have been those which, instead of seeking to increase the efficiency of a given function, questioned the utility of effectiveness of the function itself, as compared with other functions or broader objectives." (34)

Menzel, in particular, has argued that the most important "innovation" yet to be adopted by state and local governments is the goal of productivity increase, and that "once that capstone objective is accepted, there will be general receptivity to the assortment of changes in "hardware and "software" that are means to the overall end. (47)

Much of the discussion about public technology and the image of low receptivity by state and local governments of new techniques and technologies has resulted in part from efforts by various Federal agencies. These agencies usually have tried to transfer technologies developed for other purposes to the civilian sector. Private firms also have attempted to move their activities from defense and space-related activities to civilian markets, and the scientific and technical communities too have often sought to apply their skills to new problems. Other interests have expressed a concern that the United States will lose its technological leadership unless high-technology firms find enough markets for their products. "Given the oft cited 'ancient' techniques held to be in use in public agencies, to many it appears virtually axiomatic that the application of existing or new technologies to public sector activities cannot but be synonymous with increases in productivity." (47)

We, too, would expect this to be the general case. But we must also recognize that counterexamples based on the same set of behavioral

*Feller, Menzel and Engel.

conditions probably exist, even though we found no such counter examples in our brief search into this area.

It appears that another of the factors shaping public debates is that, while much of the technology currently employed in state and local agencies can be described as "ancient," almost always too big a jump has been attempted in developing new products. It has been suggested that it may be that the jump between the agency's current operations and the proposed techniques "reflects the technical orientation and capabilities of the suppliers, with the result that products are developed which are neither technically reliable nor cost-effective in terms of the activities of public agencies." (52) Product engineering attuned to user needs would appear to be an obvious requirement here and thus has become a major element in Federal programs to promote the development of public sector technology. It still remains an open question, however, "as to how much change on the part of the public agencies is due to inherent organizational or environmental characteristics and how much to poor product engineering on the part of the suppliers, both public and private, of these tools and techniques." (47)

C. Barriers in the Public Sector

The literature (mainly on public technology) has identified the following as the principal impediments to a more rapid diffusion of innovations in the public sector:

- Perverse incentive systems. Government management systems generally penalize bad performance more than they reward good performance. Adoption of new technology is a form of risk-taking. Managers receive little in the way of credit for improving operations, but can be penalized for efforts that fail. (3, 18, 47)
- Lack of objective performance measures. Measurement of the overall quality of services provided by public agencies is often lacking, especially in terms of "productivity" measures which relate the quantity of inputs employed by an agency to the goods and/or services it produces or in terms of cost-effectiveness. The absence of such measures leaves most top levels of management in bureaucracies with few norms by which to judge how well a public agency is performing. This lack of any objective measure to demonstrate to top managers why adoption of a new tool or technique will improve

performance encourages only satisfying behavior; this means that, as long as no violently negative comments are made with respect to agency performance, the agency will probably continue to operate as it has in the past and will not search for new tools, techniques or processes. (23, 28, 39) It should be noted that even when the electoral process provides a means for evaluating performance, the measures of performance are not the same as those registered by the individual as a consumer in the private market environment.

- Short-term horizons of time, on the part of elected officials, limited by their terms of office. This time constraint leaves officials with little incentive to undertake projects in which costs largely occur in their existing terms of office and benefits are deferred to the future. Short-term political gains held necessary for re-election are usually based towards cutting expenditures, not towards investing in long-term, cost-saving approaches. (34, 68)
- Inflexible civil service or union agreements. Technological change is often labor-saving. In other situations which are not directly labor-saving, readjustments in the work schedules are often required for economical employment of the new technique to be warranted. In either case, some changes in existing labor practices are required, but these are often resisted by public employee unions. (18, 23, 65) Similar union barriers also exist in private industry, although civil service agreements are seen to provide an extra barrier for public agencies.
- Entry only at the bottom level. As opposed to the usual practice in private business, typical managers in some public agencies, especially service providers, can attain their positions only by "serving successively in each level of the organizational hierarchy." This policy tends to prevent the employment of "outsiders" with potentially fresh opinions and outlooks, to lead to minimal organizational roles for staff rather than line activities, and to create an aura of "professionalism" around such bureaucrats without the accompanying attribute of specialization. (10, 23, 47)
- Inadequate or inflexible budgets. Adoption of new technology almost always requires either additional funds or administrative flexibility to re-allocate existing funds. Public agency budgets are usually viewed as being inadequate in these areas. (34, 47)

- Lack of political appeal of productivity change. Proponents of new technologies, either in the "think tanks" or in the public agencies themselves, have often failed to convince elected officials that the new tools, techniques or processes have sufficient political pay-off, in terms of increased electoral support, to warrant undertaking the various conflicts (e.g., changes in collective bargaining agreements or work rules) that may be necessary before they can be successfully adopted. (68)
- Lack of internal evaluation capabilities. Analysis of the technical and operational reliability of the new techniques usually exceeds the internal capabilities of state and municipal agencies. These agencies are at the mercy of the salesman. Myers reports that "many agency officials may act (prudently) according to the dictum of once burnt, twice shy." (52)

One other potentially inhibiting factor mentioned in the private sector literature that appears worthy of special note for public sector innovations might be maintenance costs. For example, Federal grants may be available to finance initial purchase and installation but not upkeep and/or replacement. In the case of one of Feller et al's sample technologies (impact attenuators) this type of capital-operating grant dichotomy existed, at least nominally. "It implied that state agencies would be responsible for maintaining and replacing these devices, and this burden of maintenance costs upon the state agencies was seen, at least by the manufacturers of these techniques, as an impediment to their adoption. "*"

D. Other Factors Influencing Bureaucratic Innovation

There are four likely contexts that create performance gaps which subsequently call for an innovative bureaucratic response. (18, 25, 39, 47, 51, 65)

- An objective change in the situation in which the bureaucracy is operating, due to either a change in operating conditions, such as a shift in the nature of the clientele ("they don't learn," and the like) or to a change in expectations.
- Divisions within the organization. Although there is a tendency for bureaucratic personnel to become socialized by accepting the norms

*Feller, Menzel and Engel.

of the organization, the socializing mechanism is almost never without problems as there are often dissenters within.

- Pressure from clients. While bureaucracies often may safely ignore changes in the situation in which they are operating, as most urban institutions did for many years, they find themselves confronted by a crisis when clients begin to question their very legitimacy. Often the organizational response to such a crisis is purely symbolic. Nonetheless, the presence of such militant client demands makes it sensible, in terms of bureaucratic survival, to react by doing something.
- Pressure from outside, through sanctions or incentives. Because it is relatively rare for state and local bureaucracies which are already using their resources fully to respond automatically to changing conditions, Federal and state policy makers have established various programs which serve to reward innovations and penalize resistance to them. "The actions of outside agencies can therefore introduce certain of the elements of a market reward system by making it in the material interest of bureaucratic personnel to both search for, and then implement, innovative tools and techniques."(47)

For the most part, however, commercial and non-commercial entrepreneurs appear to be the central external agents in the generation of technical change. These include commercial manufacturers, private consultants, contractors, universities, private research institutes and Federal agencies.(18, 23, 25, 34, 39, 47, 51) Of particular importance is the influence of the Federal government, and intergovernmental relations in general, in the diffusion of innovations in the public sector.(47)

E. The Federal Influence and Intergovernmental Relations

The Federal government clearly influences the diffusion of technological innovations within and among other governmental agencies. The states and their administrative components are not autonomous decision-making entities. "American national and state governments influence each other within a federal arrangement," declares Douglas D. Rose. "A phalanx of influences goes into and out of policy," Rose continues, "and it is doubtful that most can be attributed to the states."(58)

Other researchers have found that such a view of state decision making underlies "the absence of any systematic variation in state receptivity to new technologies which can be explained principally in terms of the organizational characteristics of state agencies. Rather, the diffusion of technological innovations in the public sector needs to be considered in terms of the Federal influence."(47)

Some studies have found that respondents for various technologies have reported that Federal money was either critical to adoption or provided an important incentive. Federal funding, however, does not provide a complete explanation.(47, 67)

Many state and local officials have cited the passage of a new act as the critical event leading to the adoption of a new technology.(58) "Although federal legislation seldom, if ever, mandates the adoption of a specific technology, it may narrow the choice considerably. Many state highway officials, for example, believe that the Federal-Aid Highway Act of 1962 was largely responsible for involving their agencies in planning activities and, therefore, highway-transportation modeling."(47)

Feller et al report that "the National Environmental Policy Act of 1969, specifically Section 102 which requires public agencies to prepare environmental impact statements, has certainly influenced the day-to-day activities of many state highway agencies." *

We have previously pointed out that a principle underlying most theories of organizational innovation is that these organizations innovate because of perceptions of a performance gap. Federal legislation, in the jargon of this literature, can be viewed as sometimes being a primary creator of a performance gap because it very often requires a state or local government to do something that it was previously not doing.

Federal influence can also be informal and personal. Federal officials can, and often do, persuade state officials that it is in the latter's best interests to adopt a new tool or technique. Federal agencies and departments can and often do sponsor technical conferences, seminars, or training sections and even demonstration projects to influence the adoption of innovations.(47) HUD, for example, is providing funding for the Capacity Building Projects whereby local governments are experimenting with new methods to improve the decision-making ability of local government officials.

*Feller, Menzel and Engel.

Information dissemination is undertaken by many groups, but again professional associations appear to play a major role. (34, 47) The agents of change and the managers of change are, to be sure, not always different entities. On occasion, change can be both induced and managed by a single agent. (34, 57, 70, 71)

What our search of the relevant literature and its subsequent synthesis have revealed, in essence, is that the "innovation matrix" (i.e., the interplay among those who adopt and those who initiate--consultants, commercial vendors, professional associations, "clearinghouse" agencies, the Federal government and other change agents) has a considerable amount of influence on the diffusion of organizational and technological innovations. A recent paper* by Feller and Menzel discusses this issue extensively and concludes that "public sector innovations therefore should be viewed from a macro-perspective; a focus limited to the attributes of adopters and their immediate environments is likely to obscure rather than clarify the 'how' and 'why' of adoption."

It seems then that such a matrix involving the Federal government, functional associations of state and local officials, and institutionalized policy-technical diffusion patterns among the states and cities operate to produce similarities in their adoptive behavior. In a seminal piece of research, Jack L. Walker takes note of this effect:

"During the last thirty years many new professional associations have been formed and more interstate and federal agencies have begun facilitating communications and encouraging national uniformity. The diffusion process is operating much faster today than ever before, especially among those states which have traditionally lagged behind in adopting new ideas." (70)

What Walker, Feller and others are suggesting, and what others have found additional evidence to support, is that patterns of innovative behavior are rapidly changing among public agencies, and that this change has been induced largely by changing intergovernmental relations and interstate communications.

*Irwin Feller and Donald C. Menzel, "Diffusion Milieux as a Focus of Research on Innovation in the Public Sector," paper presented at the American Political Science Association Convention, San Francisco, September 1975.

V. MAJOR SHORTCOMINGS OF THE LITERATURE

The major shortcomings of the literature are identified as follows: the pro-innovation bias, in which innovation adoption is assumed to be appropriate behavior for all units in a system; lack of an over time process orientation because most past research on organizational innovativeness has been based on one-shot surveys; the psychological bias, with over-emphasis on the individual as a unit of analysis, thereby short-changing structure; lack of attention to several attributes of the adoption environment and a lack of information on the industrial characteristics of firms that market to the public sector; and the initiation-implementation confusion. The concluding remarks of this chapter focus on the needs of a general theory of innovation and diffusion.

A. The Pro-Innovation Bias

For better or worse, the act of innovating still appears heavily value-laden in the positive direction. "Innovativeness, like efficiency, is a characteristic deemed worthy for social organisms to possess. Unlike the ideas of 'progress' and 'growth', which have long since been casualties of the 'new consciousness', innovation, especially when seen as encompassing more than purely technological change, in most minds is still associated with inevitable improvement." (23) The "classical" diffusion model assumed that everyone in the audience should adopt, that diffusion rates should be rapidly increased, and that any non-acceptance was an undesirable and/or an irrational decision. (55)

Everett Rogers points out that this pro-change bias may well have been justified in the case of many of the agricultural innovations that were originally studied by rural sociologists and which so strongly flavor most subsequent conceptions of the diffusion process.* "After all," declares Rogers, "hybrid corn was really a highly profitable innovation for the agricultural business." But many innovations undoubtedly do not have such universal usefulness, and these particular innovations then may only be appropriate for adoption by some individuals, and by some organizations. Rogers suggests that "methadone maintenance and dial-a-ride buses would appear not to be in the same league of relative advantage as hybrid corn."

One of the major flaws in current policy discussions concerning the adoption of technological innovations in public agencies appears to be the frequent leap to the conclusion that successful applications of given techniques in

*Everett M. Rogers, "Innovation in Organizations: New Research Approaches," paper presented at the American Political Science Association Convention, San Francisco, September 1975.

some agencies produce standards by which the innovativeness of other different agencies can be judged. Most of the diffusion literature, especially that on production techniques, is concerned with techniques that eventually replaced earlier methods in a set of firms which had comparable technical requirements. The eventual superiority of the technique under study nearly always leads, retrospectively, to the use of such terms as "innovative," "progressive," or "modern" to describe those firms which were among the first to use the new technique and to the use of such terms as "laggard" or "conservative" to describe those who are late adopters or nonadopters. Much of the public technology debate assumes that technology exists, that is, that clearly superior alternatives to existing methods are in use. Given this assumption, late adopters or nonadopters can likewise be described as "conservative," "noninnovative," etc. (47)

Not all innovations, however, are successful. Many applications of new technology "fizzle out" after a flurry of early adoptions. More attention needs to be paid to these unsuccessful innovations that obviously do not diffuse along an "S" curve.

We concur with Rogers who states in his previously-noted paper that "shedding the pro-innovation bias in diffusion research should lead to serious questioning of how 'good' the innovations being investigated really are, rather than assuming they have considerable relative advantage over previous practices."

B. Lack of a Process Orientation

Diffusion is a process, but the research designs and measurements of diffusion almost never adequately allow analysis of the over-time aspects. We found too that very few researchers have included data gathered at more than one temporal observation point. Therefore, almost all of the research conducted on innovations and diffusion has been unable to trace the change in a variable over "real" time; Rogers declares that "these investigations are in fact only dealing with the present tense of innovation behavior. Diffusion thus becomes, in the actuality of research operations, an artificially-halted snapshot, representative of one point in time."

Most diffusion research designs include correlational analyses of cross-sectional data gathered in one-shot surveys of the responding units, thus following the method pioneered by the early rural sociologists. These research designs shed little light on the process of diffusion over time, other than what can be reconstructed from recall data. Rogers has recently suggested that "diffusion research ought to make much greater use of field experiments, longitudinal panel studies, and other types of research designs which are better able to take 'moving pictures' of the diffusion process." This recommendation would appear to be relevant for all types of diffusion study, but especially for investigation of innovation in organizations.

Speaking about studies of organizational innovativeness, Hage and Aiken critically note that: "The current state of knowledge about organizational behavior is based to a great extent on cross-sectional studies.... They fail to sensitize the student of organizations to the ongoing process of change in organizations. Organizations seldom stand still."(32)

Cross-sectional survey data cannot answer many of the "why" questions about the diffusion of innovations. The one-shot survey generates descriptive data, of course, and permits a type of correlational analysis in which independent (causal) variables are associated with the dependent (effected) variable--usually "innovativeness." Such an approach, however, tells the researcher little about why a particular independent variable covaries with this "innovativeness."

Most of the publications concerned with innovation in organizations were relatively late on the diffusion research scene, and were undoubtedly influenced by their non-organizational intellectual ancestors. Specifically, almost none of these studies deal with the innovation process in organizations: Hage and Aiken, for example, complain that "There have been few studies of the actual process of change in organizations."(32)

According to the most recent work of Rogers, the researchers utilizing large-sample surveys which predominate among the relevant publications "were actually only studies of organizational innovativeness, but not of organizational innovation. It appears that there is a very important difference. The large-sample surveys mainly compared the various organizations (that were the responding units) on innovativeness; they searched

for correlations between selected (and often stereotyped) independent variables with innovativeness. So unfortunately most of these studies of organizational innovativeness tell us very little, or nothing, about the process of within-organizational innovation."

As a result of the methodological approaches used (usually mailed questionnaires to chief executives), researchers have learned about certain characteristics of organizations related to innovativeness, but they really lack an understanding of how communication and decision-making processes are involved in innovation within organizations themselves. Such intra-organizational innovative behavior cannot be properly understood if it is only viewed through the eyes of those at the top of the organization's hierarchy and the results have been biased from the start.

C. The Psychological Bias

Zaltman et al have reported that treatments of innovations vis-a-vis organizations tend to follow the individual-oriented approaches, (76) while Coleman et al claim that the overwhelming focus on the individual as the unit of analysis in diffusion research (thereby largely ignoring the importance of relationships between sources and receivers) is often due to the assumption that if the individual is the unit of response, he must consequently be the unit of analysis. (16) "Only recently has the main focus in diffusion research on the individual as the unit of analysis shifted to the clique, network, organization, or system of individuals, and hence to the relationships between individuals, rather than on the individuals themselves."*

Such conceptual-methodological approaches suggest that even when the individual is the unit of response, the relationship can be the unit of analysis via some type of sociometric measurement and network analysis. "Sampling and data-analysis procedures for relational analysis are being worked out, but still lacking are relational concepts, and theories linking these concepts."**We feel, as does Rogers, that until diffusion scholars begin to think in relational terms, there will not be much relational analysis.

*Rogers.

**Rogers.

D. More Attention to Adoption Environment

It seems that more attention needs to be given to several attributes of the adoption environment, especially that concerned with innovations and their diffusion in the public sector. Included here would be what Douglas Rose calls the "federal arrangement." (58) "The technology diffusion data indicate that the formal and informal arrangements through which local, state, and Federal governments influence each other are significantly and sorely in need of systematic study, and it seems reasonable to make the same demand with respect to managerial innovations." (47)

There needs to be more research examining how variations in local practice along with the legal and constitutional division of powers affect the diffusion of innovations. The fragmentation of methods adopted for solving problems which grow out of intergovernmental arrangements may also be in need of systematic study.

Another area in need of close attention is the impact of local public interest groups and their unique agency constituencies with regard to the position on a change taken by a public bureaucracy. Virtually no research has been conducted on the barriers to innovations created by professional vested interests, especially when the changes involve the reallocation of public resources.

Also in need of consideration are other attributes of the environment in which the innovation adoption will occur. One is the marketing behavior of private vendors. It would appear conceivable, "at least in the case of technological innovation, that where and when a vendor chooses to market a new product or process produces an 'innovative' adoption unit." Feller and Menzel lament that "there is little information available on the marketing strategies of firms that sell new technology in the public sector."

Another attribute of the adoption environment that Feller and Menzel suggest needs systematic study is the knowledge infrastructure of a functional (policy) field. "This refers to the nexus between producers, suppliers, intermediaries (e.g., professional associations), and the consumers of public technologies/programs. The budget-based service institution is a complex process of fragmented responsibilities and 'checks and balances.' Determining service relevancy and cost effectiveness in the larger economic

context requires that the gap between funds given, and services received, be bridged by a system and structure that directs towards performance and responsiveness."

E. Initiation - Implementation Confusion

Most theorists generally terminate their analysis at the adoption stage while others assume no apparent difference between initiation and adoption. The notion that the innovation process consists of a series of stages has been current for some time; however, a distinction needs to be made between two main stages in the innovation process:

- Initiation - the process through which an organization becomes aware of an innovation, and decides to adopt it.
- Implementation - the process through which an organization puts the innovation into practice, and eventually institutionalizes it into its ongoing operations.

As mentioned in Section III, Wilson, Sapolsky, Zaltman and other researchers have clarified this confusion somewhat by arguing that the structural characteristics of an organization which facilitate initiation of the innovation process (such as high complexity, low formalization, and low centralization), by opening the organization to its environment, at the same time make it difficult for the organization to implement the innovation.

In his recent work, Rogers has taken this classification one step further and constructed a useful table which shows the positive and negative relationships between various organizational structural variables and different stages in the innovation process. (See Table 2.) Zaltman and Duncan have suggested that "this paradox might be solved by an organization creating a sub-system that is complex, informal, and decentralized (like an R & D unit) to initiate innovations, while the remainder of the organization is low in complexity, formalized, and centralized so that it can facilitate the implementation of innovations. However, such a dual structure may in fact be impractical or impossible for many organizations." (76)

TABLE 2

Organizational Structural Variables May Play Different Roles
at Different Stages in the Innovation Process in Organizations

Organizational Structural Variables	Expected Relationships with Structural Variables at Stages in the Innovation Process	
	I. Initiation	II. Implementation
1. <u>Complexity</u> (the number of occupational specialties and their professionalization). Diversity encourages members to conceive and propose innovations, but makes it difficult to achieve consensus about which innovations to implement.	+	-
2. <u>Formalization</u> (the emphasis upon following rules and procedures in role performance). Flexibility facilitates consideration of innovations by organization members, but its opposite, formalization, encourages implementation of innovations.	-	+
3. <u>Centralization</u> (the concentration of power in an organization). New ideas are often generated at some distance from top officials in a centralized organization, but such centralization facilitates the implementation of innovations.	-	+

Source: Everett Rogers, "Innovation in Organizations: New Research Approaches," paper delivered at the 1975 Annual Meeting of the American Political Science Association, San Francisco Hilton Hotel, San Francisco, California, September 1975.

F. Miscellaneous Shortcomings

In addition to the deficiencies discussed in the previous section, several miscellaneous shortcomings were discovered in the literature:

- a lack of theories and empirical testing of hypotheses concerned with the modification of innovations; the later adopters, for instance, might not readily be innovative in exactly the same manner as the first adopters.
- little or no research focusing on the adoption of numerous innovations by a single organization.(47)
- vagueness of diffusion theories when accounting for the first adopter.
- lack of measurement of the differential levels of benefits to change-agents.
- little research on how the existence (and the number) of items or programs competing with the innovation affects its diffusion; presumably, in conventional economic markets this should be reducible to a question of relative profitability, relative investment required, etc., but no information is available on the less conventional markets.(74)

G. Toward a General Theory

A general theory of innovations would need (i) a specification of the matrix formed by important primary variables, (ii) an explanation of what occurs in each cell, and (iii) how the cells are related to each other in terms of the varying effects of determinants among them.

We believe that our Summary Matrix and narrative have provided many answers to questions about (i) and (ii) above, but we have to admit that it is the interrelationships between the factors about which little is known. There exists a theoretical gap in the literature for integrating "internal" and "external" factors into a single theory of organizational behavior. Thus Becker and Whisler have written:

"An adequate theory of organizational innovation, as we see it, awaits a careful statement of both environmental and internal inputs and explicit analysis of the interrelationship of these two classes of inputs."(8)

Perhaps the most straightforward way of accounting for the extraordinary empirical instability and theoretical confusion which arise when one surveys the results of innovation studies is to accept Rowe and Boise's suggestion to "reject the notion that a unitary theory of innovation exists and postulate the existence of distinct types of innovations whose adoption can best be explained by a number of correspondingly different theories." (60) These theories can differ with respect to the variables that are included in them, or they can contain the same explanatory variables while positing different interrelationships among them and different effects upon the dependent variable. In any event, "the very existence of empirically distinguishable categories of innovations and their associated models would help to explain why studies employing roughly the same predictors often realize contradictory findings and why the explanatory power of individual variables is unstable across them." (23) In addition, great numbers of hypotheses remain untested, the greatest inadequacy being the lack of data to test them.

In conclusion, we hope that this summary and organization of the literature related to key factors involved in the transfer and implementation of innovation and change, despite the shortcomings, will stimulate and be of use to both practitioners in the public sector who cope with the day-to-day problems of policy, resource and program management, and academics not directly involved in the innovation diffusion literature but involved in related areas of professional concern.

APPENDIX A

SOURCES, FIELDS SCANNED, SELECTED AND EXTENSIVE
BIBLIOGRAPHIES, SELECTED ANNOTATIONS OF RECENT
WORKS ON LOCAL AND STATE GOVERNMENT

APPENDIX A(i)

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Administrative Science Quarterly	Management Science
American Behavioral Scientist	Nation's Cities
American Economic Review	Operations Research
American Journal of Political Science	Policy Sciences
American Journal of Sociology	Policy Studies Journal
American Political Science Review	Public Administration Review
American Sociological Review	Public Interest
Bureaucrat	Public Opinion Quarterly
Business Review	Public Policy
Daedalus	Quarterly Journal of Economics
California Management Review	Rural Sociology
Econometrica	Social Forces
Harvard Business Review	Social Problems
Journalism Quarterly	Social Science Quarterly
Journal of Applied Behavioral Science	Socio-Economic Planning Sciences
Journal of Business	State Government
Journal of Political Economy	Urban Affairs Quarterly
Journal of Politics	Urban Studies
Journal of the American Institute of Planners	

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Biller, Robert, University of California, Berkeley.
Bingham, Richard, Marquette University.
Clark, Terry N., University of Chicago.
Duncan, Robert, Northwestern University.
Feller, Irwin, Pennsylvania State University.
Gray, Virginia, University of Minnesota.
Menzel, Donald, West Virginia University.
Mohr, Lawrence, University of Michigan.
Rogers, Everett, Stanford University.
Walker, Jack, University of Michigan.
Wilburn, York, Indiana University.
Wildavsky, Aaron, University of California, Berkeley.

APPENDIX A (ii)
ACADEMIC FIELDS SCANNED FOR LITERATURE SEARCH
(In order of their input salience)

- 1) ORGANIZATION THEORY
(eg: Characteristics of innovative organizations)
- 2) PUBLIC ADMINISTRATION
(eg: Bureaucratic barriers to innovation in public agencies)
- 3) POLITICAL SCIENCE
(eg: The differential adoption of laws by states)
- 4) BUSINESS MANAGEMENT
(eg: Leadership style conducive to innovative environments)
- 5) ECONOMICS
(eg: The effects of size and market structure on innovations)
- 6) INDUSTRIAL MANAGEMENT
(eg: Diffusion of a new product among consumers)
- 7) RURAL SOCIOLOGY
(eg: Diffusion of farming techniques)
- 8) SOCIAL PSYCHOLOGY
(eg: Motivation of individuals in organization that encourages innovation)
- 9) PSYCHOLOGY
(eg: Traits of individuals most likely to be innovative)
- 10) CITY PLANNING
(eg: Diffusion of land use and urban growth models)
- 11) EDUCATION
(eg: Correlates of educational innovation diffusion)
- 12) MEDICINE
(eg: The contagion of a disease)
- 13) MEDICAL SOCIOLOGY
(eg: Drug adoption by physicians)
- 14) PUBLIC OPINION
(eg: The spread of news of various assassinations)
- 15) GEOGRAPHY
(eg: Automobile and telephone diffusion patterns)
- 16) ANTHROPOLOGY
(eg: Diffusion of traits among primitive tribes)

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APPENDIX A (v)
THREE DETAILED ANNOTATIONS

1. Richard D. Bingham, "The Adoption of Innovation by Local Government," Office of Urban Research, Marquette University, Milwaukee, Wisconsin, November 1975.

Bingham's study attempts to answer two fundamental questions. First, why do some local governmental units readily adopt technological innovations while others virtually ignore them? And second, what are the processes usually followed in adopting innovation?

Two technological innovations, one product innovation and one process innovation, were examined in each of four areas: (1) school districts, (2) public housing authorities, (3) public libraries, and (4) two common functions of city government. The study covered innovation adoption in these units in all American cities with a population of 50,000 or more in 1960.

The innovations in public housing were the application of computer systems to housing authority management and the use of prefabricated components in high rise construction. In public school districts the innovations Bingham examined were the adoption of videotape recorders by secondary schools and the use of a system of individualized instruction in elementary schools. The two library innovations were the application of computer systems to public library management and the adoption of a theft detection system. For the common functions of city government, the investigation covered the use of automatic data processing equipment by police departments and the contracting with Mainstem, Inc., of Princeton, New Jersey, for vehicle maintenance management service.

Both quantitative and qualitative methods were used in this study. Initially, Bingham used statistical techniques to examine the effects of the community environment, the greater organizational environment, and the characteristics of the organization upon innovation adoption. Simple and multiple regression and correlation were utilized to explain innovation adoption while partial correlation coefficients were used in testing the adoption model.

In search of "innovative" cities the study examined geographic patterns associated with the adoption of each innovation. It was found, however, that there does not appear to be any substantial number of innovative cities. Innovation seldom stretches beyond the particular agency.

Bingham did find, however, that innovations were diffused in a regional pattern. Modular housing, for example, was largely restricted to a Northeast-Northcentral belt running from Massachusetts to Illinois. Most of the innovations studied had

similar regional concentrations although they do not show significant overlap. There did not seem to be national diffusion patterns of innovation in local government. Diffusion patterns and cue-taking appeared to exist, but these patterns were largely determined by the specific innovation.

City size and socioeconomic status (SES), were found to be influential determinants of innovation adoption. Relationships were indirect, however, and influenced adoption only through characteristics of the organization and the organizational environment.

Based upon post hoc results, Bingham was also able to distinguish innovations which were adopted for apparent amenity (versus need) reasons. Programs of individualized instruction, for example, did not appear to have been developed explicitly for either low or high expenditure school districts. The post hoc examination of adoption patterns suggested that individualized instruction is an amenity adoption. High levels of use of individualized instruction were found largely in high SES cities with low school dropout rates and a high percentage of college bound students. These communities also provide high levels of funding for public schools as well as a lower pupil/teacher ratio.

"Conservative" or "liberal" community attitudes, at least as Bingham measured them, had little to do with the adoption of technologies by local bureaucracies. In the case of two of the process innovations, however, community attitudes appeared to affect funding levels and funding priorities which, in turn, influenced innovation adoption. Community attitudes thus appear to affect adoption only through the provision/withholding of funds or the determination of spending priorities such as emphasizing school expenditures at the expense of other local governments.

Within the organizational environment, direct or indirect assistance by the Federal or state government was an important determinant of process innovation adoption. Of equal importance, however, was the intergovernmental assistance provided to local governmental units by other units of local government. Resource availability, loosely defined as "slack" resources, was found to be an extremely important stimulus to innovation adoption. Resources in the form of funds, equipment, and/or specialized or expert assistance were found to be directly or indirectly related to process and service innovations in every case. In addition, in those cases where a number of variables contributed independently to innovation adoption, it was the external resources which carried the greatest weight in stimulating innovation.

The characteristics of the organization, with the exception of organizational size, were found to not generally affect adoption levels. The findings suggest that the independent effect of organizational size is as a resource. Other things being

equal, low personnel levels seemed to lead to efficiency or need-based innovations, while high personnel levels lead to amenity adoptions.

In his conclusion, Bingham notes that the community environment affected innovation adoption significantly, but only indirectly. The most constant relationship noted was the apparent determining relationship between the community and demand (measured in terms of problems to be solved). Demand, on the other hand, appeared to affect only organizational characteristics and the organizational environment.

In conclusion, three policy proposals emerge from this study. First, Bingham suggests a de-emphasis on hardware and an increasing emphasis on process. Secondly, he suggests a program for the certification of service innovators. And thirdly, he suggests Federal funding for innovation adoption through professional associations. It is Bingham's belief that the combination of the above three proposals into a coherent policy of technology transfer will assist in the rapid adoption of technology by all types of local government.

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2. Irwin Feller, Donald Menzel and Alfred J. Engel, Diffusion of Technology in State Mission-Oriented Agencies, Institute for Research on Human Resources, Center for the Study of Science Policy, Pennsylvania State University, University Park, October 1974.

The study reports the results of an exploratory effort concerning the diffusion of technological innovations in the public sector and attempts to answer the following questions:

- Is there a systematic tendency for some states to be early adopters and others laggards?
- What factors influence patterns of adoption?
- Do diffusion networks (leader-follower relationships) exist among agencies in the different states?
- What are the characteristics of the diffusion process in the public sector?

The conceptual framework underlying these questions was derived primarily from the literature on organizational innovation. The research focused on: inputs (variables that predispose an organization to innovate); outputs (the number and kind of innovations adopted); and process (the sequence of events from input

to output). The report contains two types of data presentation: quantitative presentations of interstate variations in diffusion, and qualitative assessments of the factors that shape the diffusion pattern.

Technological innovation was defined as the adoption of a process or product by two types of state agencies: highways (or transportation) and air pollution control. In each type of agency, a pair of innovations, one product-oriented and the other process-oriented, was studied. The technologies were impact attenuators and transportation modeling, and automatic telemetry systems and air pollution modeling.

Field interviews in ten states (Michigan, North Carolina, California, Kansas, Maryland, Minnesota, West Virginia, Illinois, New Jersey, and New York) were conducted. The ten states were chosen on the basis of adoptive behavior and reputation as a national or regional leader. With respect to adoptive behavior, the telemetry and impact attenuation technologies were given priority to determine a mix of early and late adopters. With respect to reputation, telephone surveys of 50 pollution control agencies, Department of Transportation data, and Walker's study of diffusion of innovation among states provided a categorization of states as leaders or followers.

This study presented two types of findings. The first involved the adoption trends of the technologies, in which diffusion curves based on the date of first adoption were presented. The results support a systematic adoption trend in the air pollution field, but not in highways. Further, agencies that were early adopters in one technology were not from the same states that were early adopters in the other technology. The second type of finding attempted to isolate, catalogue, and assess the major variables that facilitate or inhibit adoption. The analysis includes the planned topics of adoption decisions, decision-unit characteristics, and tests of relationships from the literature as well as topics such as the role of the outside entrepreneur, the role of Federal influence, and the role of professional intermediaries that evolved in the course of the research.

With respect to air pollution telemetry, statewide problems of long duration, and in states where the state was responsible for pollution management, obstacles to adoption were insufficient resources, lack of confidence in technology, disbelief in Federal approval for innovation, and bureaucratic risk. As for modeling, the factors influencing adoption included Federal legislation, the presence of personnel qualified to model, and a perceived need to do so. Consideration of the decision unit revealed that "hardware" decisions (telemetry) were more likely to involve high ranking officials and outsiders than "software" technologies such as modeling.

Impact attenuator adoption is widespread (48 states in 1973) apparently as a result of public attention and a publication of the American Association of State Highway

and Transportation Officials on Safety Practices as well as 1967 Congressional hearings. In addition, the large body of research that attests to the efficiency of the technology and the resources provided by the Federal Highway Act (1962) requiring states to develop plans for the orderly expansion of highways and related modes of transport. These were the only factors cited in the report. The composition of the decision units is similar to those found in air pollution, with "harder" technology involving more persons of higher status and more outsiders than "soft" technology.

With respect to adoption characteristics, the report started with seven hypotheses relative to the major attributes of decision makers, units, and the settings of decisions. Variables included size, prestige, professionalism of staff, interaction with leaders (both personal and professional), agency resources, autonomy, and organizational professionalism. Only one of these systematically related to adoption: non-adopting air pollution agencies had fewer resources than adopters. Further, no rank order relationship was found between date of adoption and current resources in either field.

The study research diverged from its original plan and examined the role of external influences in the diffusion process. First, the study identified three areas of Federal influence: legislation, funding, and technical assistance. The relevant findings were that Federal money was critical to adoption for 35% of the respondents; 60% reported attending Federally sponsored technical seminars; over half felt they were very effective. 58% of the respondents felt that Federal demonstrations were helpful, but the contrast among agencies was marked: 72% of the highway personnel reacted favorable, whereas 64% of the air pollution officials were negative. The report suggests that different Federal-state relations exist in highway and air pollution: highway agencies are much more cooperative, promoting diffusion; the environmental agencies relate with dominance/submission, thus retarding diffusion and risk bedring. Second, the study identified at least six other types of external change agents that appear to facilitate adoption: manufacturers, consultants, universities, research institutions, and professional associations.

The main conclusion of this report is that external change agents (the Federal government, commercial entrepreneurs, and intermediary associations) are more important than other factors in producing differential patterns of adoption. The patterns of innovation are changing rapidly among public agencies, induced by changing inter-governmental relations and interstate communication. Thus, the innovation process is seen as a mutual accommodation of a multitude of factors including individual motives, organizational perspectives, and institutionalized ways of disseminating information.

3. R. K. Yin, K. Heald, and M. Vogel, "Tinkering with the System: Technological Innovations in State and Local Governments," R-1870-NSF (Draft), October 1975.

This document represents a final report to a year-long study supported by the National Science Foundation. The purpose of the study was to assess previous experiences with technological innovations in local services and to identify those factors that have been associated with the successful use of such innovations. This was accomplished through a review and analysis of 140 case studies of a local organization's first experience with a new technological device. Federal policy-makers appear to be the primary audience for the findings of this study.

In each case, the unit of analysis was an innovative effort that centered on some technological device. The initial analysis simply examined the attributes of the innovative device that were associated with successful efforts. The results evidenced a few common characteristics correlated with successful efforts, even though the 140 case studies included a varied array of hardware innovations, computer systems, and data analysis innovations. These characteristics--visibility, divisibility, relative advantage, and transitivity--were furthermore similar to those found in previous studies of technological innovations, studies mainly of the private sector. The parallel results suggest that devices that are more easily adopted or implemented may indeed share certain desirable features, all other things being equal.

Successful efforts were also found to be a function of identifiable attributes of the background setting (exogenous factors) and the immediate circumstances for any given innovative effort (endogenous factors). In fact, the best explanation for the occurrence of successful efforts was not just built around device attributes alone or even around exogenous or endogenous attributes alone, but around all three. In particular, successful innovative efforts were most likely to occur when:

- practitioner training had occurred;
- there was not a rich innovative environment or previous history of innovative efforts on the part of the agency; and
- the innovative device was transitive (i.e., attempted to change practices between service providers and clients) and was a hardware innovation.

In terms of the major influences, endogenous factors, though somewhat more important than device and exogenous factors, did not play a more dominant role. The main conclusion was, on the contrary, that successful innovative efforts involved a variety of conditions, some related to the background setting (exogenous), and others related to the immediate circumstances (endogenous).

The most theoretically significant aspect of the authors' findings followed a comparison of the attributes related to the two components of successful efforts--service improvement and incorporation. Even though these two components were highly correlated with each other, there were nevertheless two different sets of attributes related to each. These two different sets were described as part of two potentially different organizational processes, one involving production efficiency and leading mainly to service improvement, and the other involving bureaucratic self-interest and leading mainly to incorporation.

The authors' claim that the basis for postulating two organizational processes was that public bureaucracies are continually innovating and changing, but they appear to do so more as a function of the opportunities for bureaucratic growth, status, and power rather than merely as a function of the need to improve services. Thus, even though a particular innovation can improve services, if it does not serve bureaucratic goals it is not likely to be incorporated. Similarly, some innovations may be incorporated because they serve these goals, even though little service improvement has been produced. In essence, because of the way in which public bureaucracies gain their income (i.e., through the annual budget review process rather than through market mechanisms) and because of the general difficulty in measuring and assessing the services that public bureaucracies deliver, innovative efforts in public bureaucracies will involve a different set of circumstances than will the adoption of innovations by individuals or private firms.

The self-interest characteristics found to be related to incorporation were the main way of identifying some of these circumstances. Service improvement most often occurred in the presence of: a transitive device; an environment that was not notably rich with innovations elsewhere; and innovative efforts that included opportunities for practitioner training. Incorporation, in contrast, most often occurred in the presence of: chief executive support for the effort; the innovator, implementor, and advocate for the effort being located within rather than outside of the agency; the innovator not having the traits often associated with cosmopolitanism; and an innovative effort in which there was no Federal support and no implementation delay.

Finally, the analysis focused on the potential role of Federal policies. This was done by correlating successful efforts and the presence of Federal support for any number of activities--e.g., technical assistance, overall support for implementation, or support for the early R&D involving the innovative device. The main finding was that no Federal factors were associated with successful innovative efforts.

One important way in which this study differs from most of the previous research on technological innovations can serve as the occasion for drawing the main implications of the findings. Unlike most studies, the investigation not only covered a diverse array of innovative devices, but it also covered a wide range of service agencies--police departments, schools, hospitals, public works departments, planning agencies, and the like.

In examining the evidence for differences among service agencies, the authors found that certain types of agencies (planning and public safety) were more frequently associated with certain types of innovations (data analysis), and that the occurrence of service improvements therefore differed among the agencies. However, in spite of these differences, they found there was no relationship between the type of agency and the occurrence of incorporation. Differences in service functions apparently made no difference, in other words, in the extent to which innovations were incorporated. The authors believe the fact that such service differences did not appear in relation to technological innovations suggests that certain bureaucratic factors may transcend service differences and represent a common condition of local service organizations.

It is the authors' conclusion that the appearance of a technological innovation has usually occurred as a small incident or diversion within this context of common conditions. Few innovations have dramatically affected the totality of the local system, and until this occurs more frequently, the innovative experience will have only a "tinkering" effect, i.e., be limited to the periphery of the local scene. More important is the contention that if Federal policies just focus on one or another type of technology in this manner, then the effect of Federal policies may also be peripheral to the functions of the local agency. In the face of continued budget reviews and cutbacks, personnel strikes, civil service regulations, professional standards, and organized client demands, a technological innovation is simply not likely to engender the degree of involvement needed to create significant change.

APPENDIX B

- (i-vi) FACTORS WHICH INFLUENCE AND ACT AS BARRIERS TO INNOVATION (Tabular Summaries)
- (vii) CLASSIFICATION OF INFLUENCES ON ADOPTION OF INNOVATIONS IN PUBLIC AGENCIES
- (viii) STRATEGIES FOR ORGANIZATIONAL CLIMATES CONDUCTIVE TO INNOVATION

APPENDIX B (1). FACTORS INFLUENCING ORGANIZATIONAL INNOVATION

INDIVIDUAL	ORGANIZATIONAL	ENVIRONMENTAL	INNOVATION SPECIFIC
<u>Managements:</u> Performance Gaps (21, 47, 71, 72, 76) Executive Ideology (22) Administrative Position and Roles (4) Professionalism (15, 47, 55, 57, 67, 76) Organizational Membership (55, 57) Cosmopolitanism (22, 55, 56, 57) Frequent Information Contact with "Outsiders" (14, 55, 56, 57) Knowledge and Motivation about Innovations (51, 55) Favorable Attitude to Change-Agents (33, 55) Desire for Aggrandizement (21) Training in Systems Analysis and other new Management Techniques (51)	Performance Gaps (21, 47, 71, 72, 76) Organizational Memory (38, 45) Uncommitted Resources - Organizational "Slack" (20, 38, 45, 47, 51, 67, 76) Size of Organization (4, 33, 43, 44, 47) Amount of Resources (33, 47) Structural Looseness (67) De-Centralized Power (32, 33, 76) Internal Complexity (4, 32, 33, 76) Autonomy and Independence (21, 22, 47) Diversity of Tasks (21, 75) Internal Incentive Reward Structure (21, 33) High Personnel Turnover (21) Filling Vacant High-Level Positions with "Outsiders" (21) New Personnel (56, 76) History of being Innovative (47, 55, 70, 76) Low Degree of Job Codification (32) Communication Channels between Organization and Technical Information Sources (69) Information Sources (69) Open System (36) Low Degree Formalization and Stratification (32) Low Emphasis on Production Volume and Efficiency (32) Job Rotation (33) Change of Leadership (33)	Performance Gaps (21, 47, 71, 72, 76) Community Stable, Homogenous, High-Status Population (63) Community Integration (1) Urbanized, Industrial, Cosmopolitan (55, 57, 70) Clientele Pressure (25) Clientele's Political Culture - Majority with "Public-Regarding" Values (1) Crisis or Accident (18, 21, 33, 40, 75) Concentration of Community Power (1) Degree of Party Competition (18, 64) Greater Centralization of Formal Political Structure (1) Rate of Community Growth (7) Clientele Change (21, 25) Technological Changes (8, 24, 76) Federal and State Governments - Grants, Legislation, etc. (23, 27, 28, 47, 70) Increasing Input Costs (69) Expanding Market for Services or Products (69, 76) Behavior of Competitors and Other Organizations (1, 4)	Low Cost (23) Rapid Cost Recovery (26) Magnitude of Benefits (26) Regularity of Financial Return (26) Profitability High (23) The Smaller the Risk - Financial, Psychological, Political, etc. (26) Testable on Small Scale (9, 26, 66) Depth of Individual Psychological or Organizational Structural Change (21, 53) Least Radical (38) Compatibility High (23, 26) Communicability High (23) Highly Visible Benefits (55)
<u>Staff:</u> Performance Gaps (21, 47, 76) High Degree of Participation in Agency-Wide Decisions (32, 33) Favorable Attitude to Change-Agents (55) Frequent Contact with "Outsiders" (14, 55) Professionalism (15, 55, 76) Psychological Security (67) Job Satisfaction (32)			

APPENDIX B(iii) FACTORS ACTING AS BARRIERS TO INNOVATION

INDIVIDUAL	ORGANIZATIONAL	ENVIRONMENTAL	INNOVATION SPECIFIC
<u>Management:</u> No Performance Gaps Noticed (21, 47, 71, 72, 76) High Political Risk (68) Distrust of Industry Experts or Other Change-Agents (55, 68) Lack of Technical Evaluation Capability (68) Aversion to Risk-Taking (11, 66) Career Self-Interest (11, 13, 14, 21, 33) Individual Biases - Screening out Data, Magnification of Data favoring his Interests (21) Conservative Ideology (21) Low Professionalism and Lack of Organizational Membership and Cosmopolitanism (15, 33, 55) Lack of Motivation and Knowledge about Innovations (51, 55) Protection of Social Status and Prerogative (11) <u>Staff:</u> No Performance Gaps (21, 47, 76) Job Security Threat (33, 68) Low Degree of Participation in Decision Making (32) Lack of Self-Actualizing Personalities (32) Lack of Professionalism (15, 55) Lack of Job Satisfaction (32)	No Performance Gaps Noticed (21, 47, 72, 76) Inertia (11, 21, 68) Organizational Memory (38, 45) Lack of "Slack Resources" (20, 51) Budget Constraints (68) No Technical Evaluation Unit (68) High Degree Centralization (32) <u>Bureaucracy:</u> (2, 3, 9, 18, 39, 47, 52, 67, 68) (10) Monocratic Social Structure; Productive Ideology; Detailed Allocation of Resources; Extrinsic Reward System Based on Status and Power; Control System Designed to Suppress Conflict; Lack of Objective Performance Measures; Short-term Time-Horizons of Elected Officials; Inflexible Civil Service or Union Agreement; Entry Only at Bottom Level; Inflexible Budgets; Productivity Change has Lack of Political Appeal; Perverse Incentive Systems; Civil Service Budget for New Positions; Qualifying Employees thru Civil Service System; Limited Capacity for Effective and Prompt Implementation; Too Labor-Intensive Lack of Independence (21) High Degree of Formalization, Stratification and Job Codification (32) Low Personnel Turnover (21) Size (4, 43, 44, 47, 51) (21, 75) Inadequate Internal Incentive Reward Structure (21, 75) High Emphasis on Production Volume & Efficiency (32)	No Performance Gaps (21, 47, 71, 72, 76) Municipalities Subordinate to Federal and State Governments (18) Little Environmental Change (21) Little Technological Change (21) Stabilized Markets (69) Stabilized Input Costs (69) Federal and State Governments - Grants, Legislation, etc. (8, 23, 27, 28, 47, 70) Rural, Lack of Urbanization (55) Other Organizations (1, 4, 33)	Large Threat to Job Security (11, 68) High Cost (23) Lack of Accepted Performance and Cost Data (68) Political Risk Involved (18, 68) Maintenance Costs High (47) Vested Interests Affected (18) Compatibility of Innovation (11, 26) Not Testable on Small Scale (66) High Cost (23, 26) Profitability -- Lack of (23) Radicalness of Change (21) Depth of Individual Psychological or Organization Structural Change (21, 53) Low Visibility of Benefits (55) Communicability Low (23)

APPENDIX B(III). FACTORS INFLUENCING THE DIFFUSION OF INNOVATIONS

INDIVIDUAL	ORGANIZATIONAL	ENVIRONMENTAL	INNOVATION SPECIFIC
Performance Gap (21, 47, 72, 76) Key Individual's Attitude toward Change-Agents (14, 33) High Level of Personal Contact/Interaction (19, 28, 29, 35) Professionalism and Cosmopolitanism of Manager and Staff (6, 16, 33, 55, 57) Organization Membership (55, 57) "Modern" rather than "Traditional" Orientation of Individuals (55, 56, 57)	Performance Gap (21, 47, 72, 76) Uncommitted Resources - Organizational Slack (38, 70, 76) Size (33, 44) Communication Links Between Organization and Technological Information Sources (69) Personnel Turnover and Entry of New Personnel (66, 76) Organizational Memory (38) Past Innovativeness (28)	Performance Gap (21, 47, 76) Regional Leaders (47, 70, 71) Peer Group Influence (19, 33) Public Interest Groups (33, 70) Competing Organizations (70) Consultants and Commercial Change-Agents (33, 49) Extensive Inter-Organizational Communications Networks (1, 21, 33) Federal Government - Grants, Legislations, etc. (28, 29, 58) Urbanized, Industrial and Cosmopolitan Community (70) Political Party Competition (28, 70) Crisis Situation (5, 33, 55, 57)	Amount of User Inter-Action (47, 73) Organizational Space Affected (59) Number of People Affected (38, 75) Minor Change (38, 75) Shallow Change (21) Amount of Information Transfers (48) Contacts with Previous Adopter (37) The Relative Advantage of the Innovation (55, 57) The Compatibility of the Innovation (55, 57) The Complexity of the Innovation (55, 57) The Trialability of the Innovation (9, 55, 57, 66) The Observability of the Innovation (55, 57) Change-Agent with Prestige and Personality in Eyes of Potential Adopters (5) Change-Agent with Good Personal Relations with Potential Adopters (5) Support of Majority, Now or in Near Future (5) Right Influence, Personal or Media at the Right Time (55, 56, 57) A Change-Agent Organization Staffed by Competent and Liberal Members (17)

APPENDIX B(IV) FACTORS ACTING AS BARRIERS TO THE DIFFUSION OF INNOVATIONS

INDIVIDUAL	ORGANIZATIONAL	ENVIRONMENTAL	INNOVATION SPECIFIC
Lack of Performance Gaps (21, 47, 76) Lack of Information Contact (33, 55, 57) Low Organizational Membership and Lack of Professionalism (55, 57) Low Knowledge of and Motivation for Innovations (51, 55, 57) Favorable Attitude of Key Individual is Lacking (14) Personal Screening Biases of Key Individuals (21) Administrative Role and Position (4)	Lack of Performance Gaps (21, 47, 76) <u>Bureaucratic Structure:</u> Monocratic Social Structure; Detailed Allocation of Resources; Productive Ideology: Extrinsic Reward System Based on Status and Power; Control System Designed to Suppress Conflict (39, 67) Structure in Which Individuals are Viewed as Deviants (55) Lack of "Slack" Resources (70) Lack of Intra-Organizational Contacts (35, 70) Little Wealth and Resources (23, 33) Little Tolerance for Diverse Viewpoints (21, 33, 61, 75) Structures Allowing Diversity of Viewpoints Are Ones in Which Innovative Implementation is Most Difficult (21, 61, 75) Civil Service Budget Approval Procedure (34, 42) Key Positions Occupied by "Conservers" (21) Few Previous Innovations (28, 55) Late Adopters or Laggards (55, 57)	Lack of Performance Gaps (21, 47, 76) Lack of Inter-Organizational Contacts (35, 70) Lack of Public Interest Groups (70, 72) Federal Government - Grants, Legislation, etc. (29, 30, 58) Political Cultural Setting - Minority Only with "Public-Regarding" Values (1) Wide Diffusion of Community Power (1) Older Cities - Less Innovative (1)	Number of Resistance Factors (33) Lack of Relative Advantage (55, 57) Low Compatibility (55, 57) Low Visibility of Results (55, 57) Big Political Risks (18) Low Communicability (23) Low Profitability (23) Individual Psychological and Organization Structural Depth of the Innovation (21) Inadequately-Endowed Change-Agent (5) Few Contacts and/or Knowledge of Previous Adopters (36) Often No Political Constituency - Innovations Don't Re-Elect Officials (42) High Cost (26, 42, 43) Don't Know Where to Look for Assistance (33, 47) Too Radical a Change (38) "Sunk" Costs of Old Technique (12)

APPENDIX 2(y)
(A SUMMARY)

FACTORS INFLUENCING INNOVATIONS AND DIFFUSIONS

INDIVIDUAL	ORGANIZATIONAL	ENVIRONMENTAL	INNOVATION SPECIFIC
Performance Gap (21, 47, 71, 72, 76)	Performance Gap (21, 47, 72, 76)	Performance Gap (21, 47, 74, 76)	Few Resistance Factors (33)
Administrative Position and Roles (4)	Organizational Memory (38, 45)	Crisis or Accident (5, 18, 21, 33, 40, 55, 57, 75)	Low Cost (23)
Key Individual's Attitude Toward Innovation and/or Change-Agent (14, 33, 55)	Past Innovativeness -- History of Being Innovative (28, 47, 55, 70, 76)	Expanding Market for Service or Product (69, 76)	Magnitude of Benefits (26)
Executive Ideology (22)	Uncommitted Resources -- Organizational Slack (20, 38, 45, 47, 51, 67, 70, 76)	Clientele Pressure (25)	Rapid Cost Recovery (26)
Professionalism and Cosmopolitanism of Manager and Staff (6, 16, 22, 33, 55, 56, 57, 67, 76)	Amount of Resources (23, 33, 47)	Increasing Input Costs (69)	Regularity of Financial Return (26)
Executive Organizational Membership (55, 57)	Organizational Size (4, 33, 43, 44, 47)	Technological Changes (8, 24, 76)	Profitability (23)
Frequent Information Contact with "Outsiders" (14, 33, 55, 57)	Internal Complexity, Decentralized Power, Low Degree of Both Formalization and Stratification, and Low Emphasis on Production Volume and Efficiency (4, 32, 33, 76)	High Rate of Community Growth (7)	Low Risk -- Financial, Psychological, Political, etc. (26)
Knowledge and Motivation About Innovations (51, 55)	Autonomy and Independence in Operations (21, 22, 47)	Stability of Homogenous, High-Status Population (1, 63)	Depth of Individual Psychological and/or Organization Structural Change (21, 53)
"Modern" Rather Than "Traditional" Orientation of Individuals (55, 56, 57)	Organizational Climate Conducive to Innovation (17, 27, 30, 54, 59, 62, 65, 69, 75)	Urbanized, Industrial and Cosmopolitan Community (55, 57, 70)	Minor/Shallow Change (21, 38, 75)
Desire for Aggrandizement (21)	Bureaucracy Minimized (7, 47, 67)	Centralization of Formal Political Structure (1)	Least Radical Choice (38)
High Level of Personal Contact/Interaction (19, 28, 29, 35)	Structural Looseness (67)	Degree of Political Party Competition (18, 64)	Little Organizational Space Affected (59)
Having High Degree of Participation in Agency-Wide Decisions (32, 33)	Low Degree of Job Codification (32, 33)	Clientele's Political Culture -- Majority with "Public-Regarding" Values (1)	Number of People Affected Inside and Outside the Organization (38, 75)
Self-Actualizing Personalities (32)	Diversity of Tasks (21, 75)	Behavior of Competitors and Other Organizations (1, 4, 33)	The Innovation's Relative Advantage, Compatibility, Complexity, Trialability and Observability (9, 26, 55, 57, 66)
Not Risk Averse (11, 66)	Internal Incentive Reward Structure (21, 33)	Peer Group Influence (19, 33)	Right Influence, Personal and/or Media at the Right Time (55, 56, 57)
Psychological Security (67)	High Personnel Turnover (21)	Regional Leaders (47, 70, 71)	Knowledge of Where to Look for Assistance (33, 42)
Job Satisfaction (32)	Filling Vacant High-Level Positions with "Outsiders" (21, 33)	Public Interest Groups (33, 70)	Amount of User Inter-Action (47, 73)
	New Personnel (66, 76)	Consultants and Commercial Change-Agents (33, 49)	Contacts with Previous Adopters (37, 70)
	Effective Communications Channels Between Organization and Technical Information Sources (69)	Extensive Inter-Organizational Communications Networks (1, 21)	Amount of Information Transfers (48)
	Key Organizational Positions Occupied by "Climbers" (21)	Federal and State Governments -- Grants, Legislation, etc. (23, 27, 28, 29, 47, 58, 70)	Change Agent Endowed with Prestige and Personality in Eyes of Potential Adopters (5)
	Job Rotation (33)		Change Agent with Good Personal Relations with Potential Adopters (5)
	Change of Leadership (33)		Support of Majority, Now or in Near Future (5)
			A Change-Agent Organization Staffed by Competent and Liberal Members (17)

APPENDIX B-(1)
(A SUMMARY)
FACTORS ACTING AS BARRIERS TO INNOVATIONS AND DIFFUSIONS

INDIVIDUAL	ORGANIZATIONAL	ENVIRONMENTAL	INNOVATION SPECIFIC
Lack of Performance Gap (21, 47, 71, 72, 76)	Lack of Performance Gap (21, 47, 72, 76)	Lack of Performance Gap (21, 47, 71, 72, 76)	Perceived Innovation Factor (33)
Administrative Role and Position (4)	Organizational Inertia (11, 21, 68)	Little Environmental Change (21)	Work Tools and Tool or Technique (32)
Unfavorable Attitude of Key Individual (14, 33)	Organizational Memory (38, 45, 70)	Little Technical Change (21)	Vested Interests Affected (18)
Job Security Threat--Career Self-Interest (11, 13, 14, 21, 33, 68)	Innovative History (28, 55)	Input Costs Stable (69)	Large Threat to Job Security (11, 68)
Protection of Social Status and Prerogative (11)	Late Adopter or Laggard (55, 57, 71)	Markets Not Growing (69)	High Cost (23, 26)
Individual Bias--Screening Out Data, Magnification of Favorable Data (21)	Lack of Organizational Knowledge of Innovations (51, 55)	Little or No Community Growth (1)	High Maintenance Costs (47)
Lack of Motivation and Knowledge about Innovative Techniques and Practices (51, 55)	Lack of Inter-Organizational Contacts (35, 70)	Lack of Crisis (5, 21, 33, 55, 75)	High Political Risk (18, 68)
Lack of Information Contact (55, 57)	Lack of Uncommitted "Slack" Resources (20, 30, 70)	Lack of Clientele Pressure (25)	Death of The Individual Psychological and/or Organization Structural Change (21, 55)
Low Professionalism, Lack of Organizational Memberships and Cosmopolitanism (15, 55, 57)	Lack of Wealth and Resources (23, 33)	Clientele's Political Culture--Minority Only with "Public-Regarding" Values (1)	Too Radical a Change (38)
Conservative Ideology (21)	Budget Constraints (68)	Clientele's Political Culture--Minority Only with "Public-Regarding" Values (1)	Lack of Relative Advantage (55, 57)
Aversion to Risk Taking--Political, Economic, etc (11, 66, 68)	Key Organization Positions Occupied by "Conservers" (21)	Older Cities Tend to be Less Innovative (1)	Little Compatibility (35, 57)
Distinct of Industry Experts and Other Change Agents (5, 55, 68)	Intra-Organization Climate Not Conducive to Innovation (4, 21, 33, 61, 65, 75)	Wide Diffusion of Community Power (1)	Low Visibility of Results (55, 57)
Lack of Technical Evaluation Capacity (68)	Little Tolerance for Diverse Viewpoints (21, 61, 75)	Rural, Lack of Urbanization (55)	Low Communicability (55, 57)
Lack of Self-Actualizing Personalities (32)	Innovation Viewed as Deviants (33)	Lack of Inter-Organizational Contact (35, 70)	Low Profitability (23)
Little Decision-Making Input by Those Individuals in Favor (32)	Inadequate Internal Incentive Reward Structures (21, 75)	Lack of Public Interest Groups (33, 70, 72)	Not Suitable on Small Scale (56)
Little Job Satisfaction (32)	High Degree of Formalization, Stratification, Job Codification and High Emphasis on Production Volume and Efficiency (4, 32, 76)	Behavior of Other Organizations (1, 4, 33)	Few Contacts with, or Little Knowledge of Previous Adoptions (36, 46)
	Low Personnel Turnover (21)	Federal and/or State Governments--Grants, Legislation, etc. (8, 23, 27, 28, 29, 30, 47, 58, 70)	Don't Know Where to Look for Assistance (33, 42)
	Lack of Technical Evaluation Unit (68)	Municipalities Subordinate to Federal and State Governments (18, 34)	Lack of Accepted Performance Cost Data (68)
	PARADOX: Structures Allowing Diversity of Viewpoints are Ones in Which Innovation Implementation is Most Difficult (21, 61, 75)		Inadequately-Endowed Change Agent (5)
	Bureaucracy: (2, 3, 9, 18, 39, 47, 52, 67, 68) (10)		Often No Political Constituency--Innovations Don't Elect Officials (42)
	Munificent Social Structure, Productive Ideology; Detailed Allocation of Resources; Extrinsic Reward System Based on Status and Power; Control System Designed to Suppress Conflict; Lack of Objective Performance Measures; Short-term Time-Horizons of Elected Officials; Inflexible Civil Service or Union Agreement; Entry Only at Bottom Levels; Inflexible Budgets; Productivity Change for Lack of Political Appeal; Perverse Incentive Systems; Civil Service Budget for New Positions; Qualifying Employees thru Civil Service System; Limited Capacity for Effective and Prompt Implementation; Too Labor-Intensive.		The Greater the Pervasiveness of Consequences (23)

APPENDIX B (vii)

CLASSIFICATION OF INFLUENCES ON ADOPTION OF
INNOVATIONS IN PUBLIC AGENCIES

	Internal Sources	External Sources
Performance gap	Professional evaluation of magnitude of problem Relative deprivation Political pressure Personnel Exchanges	Legislation Performance Standards Manufacturer's R&D Federal R&D
Search behavior (awareness)	Professional contacts (individuals, literature, associations)	Training sessions- specific technique Demonstration projects Information systems
Technical feasibility	In-house evaluation Imitative behavior	Testing Certification User-oriented R&D
Cost	State funds Budget flexibility	Categorical grants Revenue sharing
Manpower	Availability of skills to design and operate system Concern over work rules	General training sessions Personnel exchanges
Organization characteristics	Formalization Centralization Complexity Interpersonal relationships Professionalism	Organization federal agencies Personnel exchanges Management techniques

Source: Irwin Feller et al., Diffusion of Technology in State Mission-Oriented Agencies, Institute for Research on Human Resources, Center for the Study of Science Policy, Pennsylvania State University, University Park, October 1974.

APPENDIX B (viii)

STRATEGIES FOR ORGANIZATIONAL CLIMATES CONDUCTIVE TO INNOVATION

Ref. #	Individuals in Organizations	Organizational Structure
(27, 30, 54, 69)	Allowed greater input in decision making.	Decentralize
(17, 54)	Provided easier suggestion input.	Improve Communication Channels
(59)	Become member of newly established R&D and Planning Groups.	
(69)	Each spending more than 50% of time on one project.	Functional Specialization
(54)	Specializing for short time.	
(17)	Encouraged to rely on others.	Functional Interdependence
(36, 50)	Managers encouraged to use "Systems Theory," forcing them to look at the whole as a set of inter-related parts.	Establish "Open System"
(75)	Become specialists in data gathering and organizational diagnosis.	Organizational Development
(27, 59, 62)	Become part of alternating temporary organizational forms within the parent organization.	Periodicity (Alternating Temporary Structures)
	<u>(IF INDIVIDUALS STILL RESIST INNOVATION)</u>	
(65)	1) Disguise the innovation. 2) Avoid major innovations -- suggest minor ones. 3) Try to gather critical mass of external and internal support. 4) Try more personal and interpersonal re-education.	

APPENDIX C

DETAILED DISCUSSIONS

TERMINOLOGIES, PROCESSES AND TYPOLOGIES IN THE
INNOVATION DIFFUSION LITERATURE

APPENDIX C (i)
DETAILED DISCUSSION OF TERMINOLOGIES

The literature sources abound in definitions and classification schemes. These terminological issues are a major reason for the lack of comparability of theoretical and empirical analyses within given academic disciplines. When one attempts to relate concepts, theories, and findings across the many disciplines in which a literature on diffusion exists, the issues become more ardent and heated. No interdisciplinary glossary of synonyms and antonyms exists.(59)

Given the diversity of definitions, attempts to suggest trends and areas of possible agreement should only be attempted with some risk. Our literature search and summary, however, suggest the following:

- Most definitions of organizational innovation focus on change which is new to the implementing organization;
- Recent definitions which have been used in empirical studies tend not to include the generation of ideas and the first or early use of ideas as part of the criteria for identifying an innovation;
- It is too early to determine whether success and/or organizational intent criteria are likely to be included in emerging definitions of organizational innovations.
- Little disagreement exists over the meaning of diffusion.

A. Organizational Innovation

A definition of organizational innovation is only gradually emerging. Several definitions have been developed. All of them focus on change, yet the meaning of innovative organizational change is not clear. A brief example of definitions will explain our dilemma.

"A fundamental change in a significant number of tasks." (61, 75)

"First or early adoption of ideas." (7)

"A change in the basic structure of an organization....involving some rearrangement in the social relationships among various segments of an organization, the manner in which roles are played, etc." (25)

"An innovation is generally defined as an idea, perceived as new by an individual (organization); the perception takes place after invention of the idea and prior to the decision to adopt or reject the new idea." (29)

"Change in the productive methods of technological leaders." (12)

"It is also an innovation if an organization learns not to do something it formerly did, and proceeds to not do it in a sustained way." (65)

Victor A. Thompson defines innovation as "the generation, acceptance, and implementation of new ideas, processes, products and services." (67) Such a definition suggests an organization with a successful process of invention, proposal, review, decision and utilization. Thompson emphasizes a capacity to generate, as well as to implement. In arguing that innovation implies a capacity to change or to adapt, Thompson states: "an adaptive organization may not be innovative (because it does not generate many new ideas), but an innovative organization will be adaptive (because it is able to implement many new ideas)." Thompson apparently sees a transference between the capacity to generate and the capacity to adapt. If an organization can create new ideas, it is much more likely to use new ideas. Conversely, an organization which is primarily dependent on outside sources for its ideas is less likely to adopt them. The source of innovation is thus an important element in Thompson's conception of organizational innovation. "By including this element, his definition is more comprehensive than those given by most organizational scholars," according to Rowe and Boise. (59)

Selwyn W. Becker and Thomas L. Whisler are among those who, in defining organizational innovation, separate the creation of an idea from its use. "Innovation," according to them, is "the first or early use of an idea by one of a set of organizations with similar goals." The first or early user is thus the innovator, regardless of the source of the idea. "First or early use, however, is a criterion which other scholars have not included in their definitions of innovation." (59)

In a study of municipal public health agencies, Lawrence B. Mohr separates invention from use, but does not include first or early use in his definition. He defines innovation as "the successful introduction into an applied situation of means or ends that are new to that situation." (51) While the agencies which added the largest number of programs and personnel early are presumably the most innovative, Mohr apparently does not exclude the late-adopting agencies from his innovative category. As Becker and Whisler point out, late users have a reduced risk due to an idea's demonstrated feasibility. "While most scholars have not accepted the definition of Becker and Whisler, some deal directly with the speed of introduction of an idea and have categorized users on this basis." (59)

The degree of "newness" necessary for innovation to occur is a recurrent theme in the diffusion literature. Any idea or process can be "new" to an organization that first becomes aware of it. Thus, Everett Rogers and F. Shoemaker define innovation as

"an idea, practice, or object perceived as new by the individual. It matters little, as far as human behavior is concerned, whether or not an idea is 'objectively' new as measured by the lapse of time since its first use or discovery.... If the idea seems new and different to the individual, it is an innovation."(57)

Other authors offer similar definitions, such as:

"Adoption of a change new to an organization and to the relative environment."(38)

"When an organization learns to do something it did not know how to do before."(65)

"The implementation of new products and ideas."(24)

"Any thought, behavior, or thing that is new because it is qualitatively different from existing forms."(5)

"The successful introduction into an applied situation of means or ends that are new to that situation."(51)

"An innovation will be defined simply as a program or policy which is new to the states adopting it, no matter how old the program may be or how many other states may have adopted it."(70)

Defining "new" in this manner leads to a focus on the communications network in which a potential adopter participates. Rogers' work is the primary example of this approach. The structure of information networks likewise plays a major role in the literature based on the work by geographers on the spatial diffusion of innovations and is implicit in one of the possible interpretations of the role of "interaction" in the diffusion process. (55, 57)

It appears that "newness" should not be taken in its absolute or objective sense, but rather the relative newness of an idea to a given role or set of roles should be used, for it is in that context that obstacles to innovation will most frequently arise. We have, in other words, emphasized that innovation itself is meant to exclude creativity per se and to include the

notion of adopting something non-traditional whether it was invented within or outside of the organization concerned. Even a late adopter, therefore, is innovating from its own perspective.

Organizational innovation, Becker and Whisler point out, "differs from (although it involves) organizational change or adaptation. The difference is manifest both in differential costs of search and in differential degrees of risk. Where others have innovated, the followers have a much smaller cost of search. Related to this difference is the reduced risk to late adopters where the innovators have demonstrated the feasibility of a new idea." But they find, as we do, "a persistent interchanging of the preceding terms and concepts in the literature. By far the greatest confusion in definition comes from equating organization innovation with organizational change. Writers vary in identifying the novelty of the proposal or adopted change in reference to either the organization's history or to the history of the organization's environment." (8) We believe that relaxation of the requirements for newness in an absolute or objective sense to be a constructive step in efforts towards achieving a viable framework for reference.

B. Diffusion

The process by which an innovation spreads is termed "diffusion." (55)
The diffusion process is the spread of a new idea from its source of invention or creation to the people or organizations which ultimately adopt or use it. At its most rudimentary level of conceptualization the diffusion process consists of

- a new idea
- individual (or organization) A who knows about the innovation
- individual (or organization) B who does not yet know about the innovation.

In addition to the two types of actors (an advocate of change and a potential acceptor) diffusion involves communication between the actors concerning the new idea or thing. (26)

A most comprehensive definition of the diffusion process would be (1) acceptance for use, (2) over time, (3) of some specific idea or practice, (4) by individuals, groups or other adopting units, linked to (5) specific channels of communication, (6) to a social structure, and (7) to a given system of values, or culture. (33, 37, 55, 67, 72)

The elements of the latter-mentioned broad definition explain why so much of the research on diffusion has been concerned with communications networks and channels and the factors influencing differential adoption patterns.

As demonstrated in our previous section, it is usually the existing operational definitions of "innovation" rather than "diffusion" which prohibit the study of the diffusion of a whole range of innovations whose characteristics may well vary at any one time and change over time. After all what is a single innovation? This cannot be answered at present. Menzel reports that "the precision of specification of the innovation--the extent to which it can be strictly and unambiguously defined--introduces further complications." (47) Consider, for example, the contrast between studying the diffusion of hybrid corn seed and studying the diffusion of PPBS (the Planning, Programming, Budgeting System) among state departments or local agencies. "The former is specific and well-defined, the latter means many different things to different agencies. PPBS is implemented in numerous ways: Some agencies may consider themselves 'adopters' by merely adopting the label, whereas others will not employ the label until they have seriously attempted to incorporate the principles of systematic analysis into their programming, planning and budgeting." (47) Warner declares that "PPBS simply cannot be defined as strictly as corn seed." (74)

APPENDIX C (ii)
DETAILED DISCUSSION OF ORGANIZATIONAL INNOVATION
PROCESSES AND PATTERNS OF TRANSFER

A. Processes

There are a number of statements of innovative processes in the literature on organizations. Among these, there are examples of several levels of analysis, e.g., individual, organizational, and extra-organizational. Rowe and Boise, however, point out that "the analytical components of these formulations, however, are sufficiently similar to suggest a generic innovative process." (59) They illustrate this with the work of three authors and then offer a simple yet comprehensive conceptualization of the organizational innovative process.

At the level of the individual, Kenneth E. Knight suggests that the innovative process consists of (1) individual recognition of a problem, (2) a search process, and (3) a problem-solution innovation. (38) Knight states that innovation takes place because of the individual's desire to innovate, but he argues that there is not yet sufficient knowledge about individual problem-solving processes to enable us to distinguish adequately between the processes used by the innovator and the non-innovator. In general, he suggests that "the innovator differs from the non-innovator in the way he identifies a problem and the nature of the alternatives he considers in trying to solve the problem." If this turns out to be the case the non-innovator may view problems in terms of existing problem categories and his or her search for solutions may be largely confined to approaches already in effect. On the other hand, "the innovator may develop new problem concepts, e.g., new combinations of interactions, resources, personnel, etc., which in turn will generate a search for solutions which were not viewed as either feasible or relevant in the past." (59) The level of entire organization, James M. Utterback describes various sub-processes which collectively can constitute a model of technical innovation within the firm. These sub-processes are: (1) idea generation, (2) problem solving, and (3) implementation and, perhaps diffusion. (69)

One conclusion drawn by Rowe and Boise from Utterback's model is "that for innovations beyond the level of the individual and perhaps small groups generally, specialized functions will probably be required from various organizational sub-processes. Although specialization is hardly unique to modern formal organizations, some specializations, e.g., the relatively creative early stages in the innovative process, and the particular climates required may be relatively unique to many organizations, e.g., various types of public agencies which are essentially designed for implementation." (59)

At the level of the entire organization and beyond, Terry N. Clark's "combined-process model" may be the most extensive statement of the innovative process yet developed." Within the context of this model, innovation may be viewed as occurring both within and outside of an organization. On the outside, an innovation may develop organically, i.e., through the progressive development of professional activities, a definition of professional status, and the formation of educational institutions to support the innovation. On the inside, an innovation may develop primarily because of the tendency of modern formal organizations toward differentiation, i.e., diverse and specialized structures tend to promote and to house innovations. In some cases, only one of these processes may occur, or they may develop concurrently with a third process of diffusion, i.e., communication, providing additional stimuli for each." Clark states that "the various processes and influences within this model can be understood by reference to a series of stages leading to the institutionalization of innovations. These are: the cumulative development of knowledge; undetected discontent (felt by those who possess new knowledge); deviation from established norms (innovative ideas are suggested); the application of methods of social control (innovative ideas are discouraged); social conflict (controls against innovative ideas break down); formulation of potential innovations; the evaluation of potential innovations; restricted trial; and adoption." (15) Clark uses the university to discuss this and other models, but argues that "the combined process model" applies to other organizations as well.

Clark's complex model extends the consideration of innovation to a pre-organization, i.e., pre-institutional, stage and suggests the importance of the diffusion process through which an organization may become aware of the possibilities for innovation. Utterback's model implies the importance of a post-organizational stage during which an organization may play a role in the diffusion of an innovation that it has implemented. Clark, Utterback, and others also suggest, however, that an organization may be the source of its own innovation and thus not solely dependent on a larger process of diffusion. An organization, then, might find itself at various points along an innovation and diffusion continuum. It might accumulate the knowledge base required for a particular innovation, formulate the innovation, make a positive decision, implement the innovation successfully, and become a beginning point in a new diffusion process. It might also be the very last implementing organization, or it might never implement an innovation." (59)

The models offered by Knight, Utterback, and Clark, as pointed out by Rowe and Boise, suggest a set of generic components for innovative processes.

Based on this, Rowe and Boise posit that a simple yet comprehensive conceptualization of the organizational innovative process would include the following broad stages: (59)

- (1) Knowledge accumulation
- (2) Formulation of an innovation
- (3) Decision
- (4) Implementation
- (5) Diffusion

It appears that "whether an innovation begins and ends with a single individual or an innovation involves an entire organization, analytically, the same basic elements are likely to be involved." (60)

Other authors have described the process as follows:

- Idea generation -- Problem solving -- Innovation (69)
- Adoption -- Diffusion -- Unanticipated Consequences (14)
- Stimulus -- Conception -- Proposal -- Adoption (8, 73)
- Recognize Problem -- Search Process -- Innovation -- Diffusion (61)

Perhaps the most revered of all writers on the subject of diffusion of innovations is Everett Rogers, and he describes the adoption process as "a mental process through which an individual passes from first hearing about an innovation to final adoption." (55) This process by which innovations are adopted at the individual level is an example of how any type of learning occurs.

Rogers conceptualizes the adoption process in five steps or stages:

- (1) Awareness
- (2) Interest
- (3) Evaluation
- (4) Trial
- (5) Adoption

At the awareness stage the individual has exposure to the innovation but is lacking complete information about it. He then becomes interested in the innovation and seeks information about it at the interest stage. At the following evaluation stage, the individual mentally applies the innovation to his present and anticipated future situation, and then decides whether or not to try it. The individual next tests out the new tool or technique on a small scale in order to determine its utility in his own situation. At

the adoption stage, the individual decides to continue the full use of the innovation. Evidence from research studies indicates that this conception of adoption stages is probably valid. (19, 28, 31, 55, 56, 57, 59, 70)

B. Adopter Categories

It would appear that both organizations and individuals within a social system can be classified on the basis of "innovativeness." A variety of categorization systems and titles for adopter categories have been utilized in past research studies.

Rogers reviewed the writings of early sociologists, learning psychologists and other students of the interaction effect and postulated a continuum of innovativeness partitioned into five adopter categories. (55)

- (1) Innovators
- (2) Early Adopters
- (3) Early Majority
- (4) Late Majority
- (5) Laggards

The five adopter categories are ideal types, conceptualizations that are based on observations of reality and designed to institute comparisons. The dominant values of each category are: innovators, venturesome; early adopters, respect; early majority, deliberate; late majority, skeptical; and laggards, tradition. "The relatively earlier adopters in a social system tend to be younger in age, have higher social status, a more favorable financial position, more specialized operations, and a different type of mental ability from later adopters.... Earlier adopters utilize information sources that are more impersonal and cosmopolite than later adopters and that are in closer contact with the origin of new ideas.... Earlier adopters utilize a greater number of different information sources than do later adopters.... The social relationships of earlier adopters are more cosmopolite than for later adopters, and earlier adopters have more opinion leadership." (55)

Table 3 presents a useful "picture" of Rogers' ideal types. Research findings, although somewhat fragmentary at the present time, indicate there is a considerable shifting of individuals in a social system from one adopter category to another over time. Laggards are most likely to drop out of the social system.

TABLE 3

A COMPOSITE PICTURE OF ADOPTER CATEGORIES

Adopter Category	Salient Values	Personal Characteristics	Communication Behavior	Social Relationships
Innovators	"Venturesome"; willing to accept risks	Youngest age; highest social status; largest and most specialized operations; wealthy	Closest contact with scientific information sources; interaction with other innovators; use of impersonal sources	Some opinion leadership; very cosmopolite
Early adopters	"Respect"; regarded as a role-model	High social status; large and specialized operations	Greatest contact with local change agents	Greatest opinion leadership of any category in most social systems; very localite
Early majority	"Deliberate"; willing to innovate after peers have adopted	Above average social status; average-sized operation	Considerable contact change agents and early adopters	Some opinion leadership
Late majority	"Skeptical"; overwhelming pressure from peers needed before adoption	Below average social status; small operation; little specialization; small income	Secure ideas from peers who are mainly late or early majority; less use of mass media	Little opinion leadership
Laggards	"Tradition"; oriented to the past	Little specialization; lowest social status; smallest operation; lowest income; oldest	Neighbors, friends, and relatives with similar values are main information source	Very little opinion leadership; semi-isolates

C. Patterns of Transfer

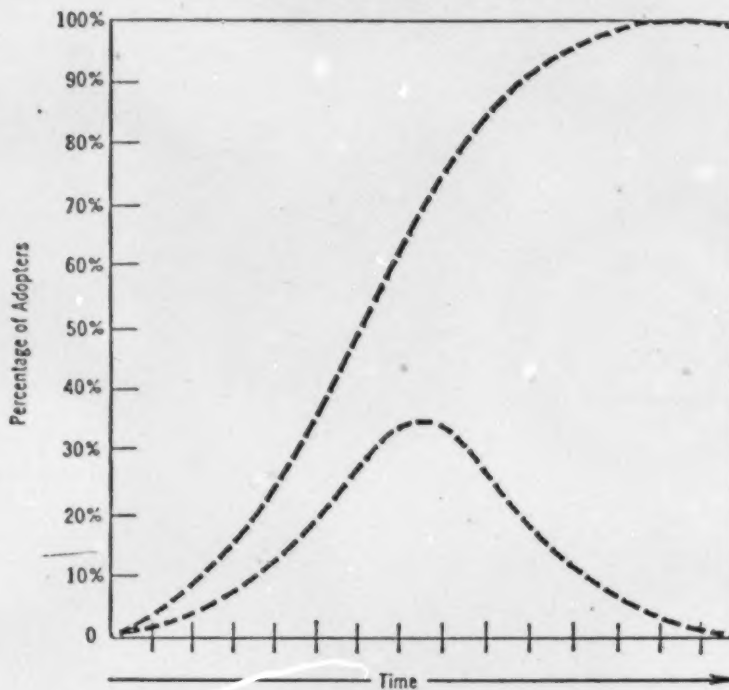
There is a mode of analysis commonly lumped under the general heading "innovation research" which focuses neither on the determinants of the adoptability of innovations nor on the determinants of innovation among organizations. Instead, it focuses on the patterns by which innovations diffuse and the comparison of those patterns. (28, 31, 33, 35, 49, 57, 63, 70) Frequently the pattern which emerges resembles the "S" curve characteristic of a logistic growth function or a cumulative normal distribution as shown in Figure 2, although not always. For instance, in his study of the diffusion of an innovative drug, Herbert Menzel found that sometimes the cumulative curve is not quite so "S" shaped and the distribution in these cases tends to be "skewed." (48) Donald Menzel, studying the scientific and technological dimensions of both "hard" (technical) and "soft" (program) innovations, found similar distorted curves to be largely created by the introduction of Federal Governmental influence in recent years. (47) Virginia Gray's research on innovative legislation in the states also found atypical distributions when investigating the introduction of civil rights legislation, especially after the middle 1960's when Federal influence drastically increased in this policy area. (29)

Rogers' adopter categories (innovative, early adopters, early majority, late majority and laggards) can in turn be partitioned on the basis of the two parameters of the normal distribution, the mean and the standard deviation. The resulting five categories are a somewhat arbitrary classification system, but when utilized by research workers, they often lead to a greater standardization of methodology. As a result, findings can be compared more meaningfully from one study to another. Figure 3 shows this breakdown of adopter categories across the normal distribution.

The similarity between the frequency and cumulative curves as shown in Figures 2 and 3 and the utilization curve that one would expect to find as a result of gradually increasing user interaction has led researchers to stress the importance of sociometric variables such as centrality in the social network, cosmopolitanness, and frequency of communication, as crucial determinants of innovation. "This would seem to provide a direct link between the study of diffusion patterns and the study of the determinants of innovation." (74)

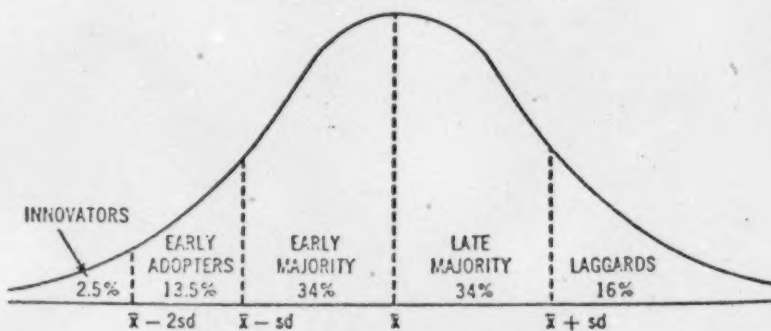
Figure 2

The bell-shaped frequency curve and the S-shaped cumulative curve for an adopter distribution.



Both of these curves are for the same data, the adoption of an innovation over time by the members of a social system. But the bell-shaped curve shows these data in terms of the number of individuals adopting each year, whereas the S-shaped curve shows these data on a cumulative basis. (Source: (57))

Figure 3
Adopter categorization
on the basis of innovativeness.



The innovativeness dimension, as measured by the time at which an individual adopts an innovation or innovations, is continuous. However, this variable may be partitioned into five adopter categories by laying off standard deviations from the average time of adoption.

Empirical studies have indeed shown virtually the same variables acting as influential as both determinants of innovation and causes of differential transfer patterns. This is the primary reason for the unified construction of the Summary Matrix presented as our Table 1 (see page 12). As we mentioned earlier, the specific factor acting either as a cause of innovation or differential transfer patterns can be found elsewhere in the appendices of this report (see Appendices B (i-vi)).

Many of our sources were specifically concerned with differential rates of adoption, and the most important point, for our purposes, was that no public agency (or other organization) is forever a leader or follower. Two researchers, Gray (28) and Menzel (47), have impressive data showing that there was not a strong tendency for the early or late adopters of one innovation to be the early or late adopters of another innovation. More specifically, Gray found that "states which were relatively quick to adopt the educational innovations were not necessarily quick to adopt the welfare or civil rights innovations (or vice versa)." (29) This finding raised the question of whether or not "innovativeness" is a general timeless phenomenon. It appears plausible to argue that some states, organizations and/or individuals may be innovative in one policy area but not innovative in many other areas.

APPENDIX C (iii)

DETAILED DISCUSSION OF CATEGORIES AND TYPOLOGIES OF INNOVATIONS

A. Two-Way Classifications

Beyond the matters of definition and differential transfer rates, authors are interested in classifying innovations. It is usually assumed that there are major (big) ones and minor (little) ones, with the more radical innovations placing different demands upon the organization than do the less radical. (38, 45, 65, 75)

Knight, in addition, proposes that there are important differences between internal and external innovations. "New and different outputs are external, new and different procedural and structural arrangements in the organization are internal." He theorizes that "not only are external innovations easier to accomplish, but that the organization will switch from one to the other under specifiable conditions." (38) Following March and Simon (65) he also distinguishes between routine and non-routine innovations (programmed vs. non-programmed). Style changes are the types of changes that are usually seen in the category of programmed innovation. Minor modifications in the product and minor extensions of the product line are other developments that usually occur routinely.

Somewhat like the Knight dichotomies, is the distinction made by Evan and Black (24) between administrative and technical innovations and Clark's internally and externally motivated innovations. (15)

Although most classification schemes appear to have little visible purpose other than to fill boxes, there are some commodities in the various classifications offered which might lead to theoretical contributions. "One common thread is that any proposal which would alter the organization itself is more radical or difficult to accomplish than a proposal that does not do so. The latter kind of proposal usually is associated with some change in the output of the organization. Thus a differential rate of innovation can be expected to exist between these two kinds of innovation." (59)

Other examples of potentially fruitful categorization schemes or typologies of innovations are plentiful. "For instance, the determinants of high-cost innovations would seem to be markedly different from those of low-cost innovations. To begin with, wealth or resources would clearly predict the former differently from the latter." Menzel suggests that "resource levels might explain much of the variation in the adoption of elaborate EDP systems by corporations but be relatively unrelated to their adoption of new supervisory techniques or job enrichment programs." (47)

Downs and Mohr suggest that typologies can be based on either "primary" or "secondary" characteristics of innovations, and that "such a distinction has important implications for how typologies could be employed and what may be their relationship to theory building." When a typology is based on a "primary" characteristic, they mean that an innovation can be confidently classified without reference to a specified organization. "Regardless of its size, wealth, complexity, decentralization, etc., each organization, if it were asked to do so, would place the innovation in the same cell of the typology. Thus, both rich and poor or large and small organizations would describe the innovation as type A; wealthy ones would not view it as type A while poor ones viewed it as type B." (23) These two writers settle for the operational, if imprecise, definition that attributes are "primary" when variations in categorizing an innovation on that dimension are negligible. "An innovation's cost and communicability, and whether it is a technical modification or a program, are probably attributes; its compatibility and profitability are not." (23)

Downs and Mohr suggest that some findings of research into the determinants of a low-cost innovation are generalizable only to other low-cost innovations. "Variations among studies in the cost of the subject innovation will cause variation among the coefficients of certain independent variables, and there is little that can be done about this instability other than to understand and accept it. There would be no point in trying to generalize about the impact of a variable like wealth, for example, on innovativeness, for wealth would have no general impact." (23)

While there have been few attempts to categorize innovations by primary characteristics, several social scientists have suggested typologies based on what Downs and Mohr call "secondary" attributes of innovations. "The rationale behind these categorization schemes is identical; it is believed that the determinants of adoption are different for different categories of innovations. However, in these cases the accurate classification of an innovation is impossible unless the researcher possesses information about the organization or set of organizations included in the sample of potential adopters." (23) Other examples from the literature are, routine vs. radical, variation vs. reorientation, major vs. minor, HAP vs. LAP, means vs. ends, and problems vs. slack. (7, 38, 43, 45, 47, 75) "What these categorization schemes have in common is that the same innovation may be classified in different categories by different organizations, e.g., an innovation might be seen as minor or routine by some organizations but as major or radical by others." (47)

Wilson's discussion of a major innovation illustrates how varying amounts of organizational space may be affected. He states that "a major innovation represents a fundamental change in a significant number of tasks." (75) For example, he argues that the change in the tasks of a single vice president

might be of greater importance than the change in tasks of ten typists. Similarly, an organizational innovation may affect varying amounts of societal space. Rowe and Boise point out that "an innovation in the processing of public assistance checks by a welfare agency, for example, may affect only public assistance recipients and thus not change the amount of societal space affected by the agency. On the other hand, an innovation of a local police department involving a change from two-man to one-man patrol cars in order to put more police officers on foot patrol may increase (or decrease) police contacts with the general public and change the amount of societal space affected." (59). Knight, too, points out that the amount of environmental (or extra-organizational) space affected by an innovation offers another means of classification. (38)

As an easy summary for reference, we present Table 4 which includes all the dichotomous classifications which we have referred to in this section.

TABLE 4

REF #	DICHOTOMOUS CLASSIFICATIONS	
(75)	Major	Minor
(38)	Big	Little
(38, 45, 65)	Radical	Non-Radical
(38)	Internal	External
(38, 45)	Routine	Non-Routine
(24)	Administrative	Technical
(15, 38)	Internally Motivated	Externally Motivated
(23)	Primary	Secondary
(75)	Number Affected Inside	Number Affected Outside
(38)	Much Organizational Space Affected	Little Organizational Space Affected
(38)	Much Environ- mental Space Affected	Little Environ- mental Space Affected

B. Four-Way Typologies

(1)	Major Innovation With Major Environmental Effects	Major Innovation With Minor Environmental Effects
	Minor Innovation With Major Environmental Effects	Minor Innovation With Minor Environmental Effects

The above typology can be extrapolated from the work of Wilson. (78)
It appears possible that a change affecting large amounts of organizational space may have little or no effect on the societal space, or vice versa. Thus, "potential organizational innovations might be considered in terms of their potential to affect the activities and interactions of a small or large number of organizational participants and/or their potential to affect a small or large number of persons outside of the organization." (59)

(2)	(i) Product
	(ii) Process
	(iii) Structure
	(iv) Individuals

This second four-part typology is drawn from Knight. (38)

(i) "Product or service innovations: "

These are the introduction of new products or services which the organization produces, sells, or gives away.

(ii) "Production-process innovations: "

These are the introduction of new elements in the organization's task, decision, and information system or its physical production or service operations, the advances in the technology of the company.

(iii) "Organizational-structure innovation: "

This includes the introduction of altered work assignments, authority relations, communication systems, or formal rewards systems into the organization. This category is in part complementary to category (ii)

since it includes the formal interactions and authority relations among the participants in the organization that are established to form the production process. In addition, this third category includes the other aspects of formal interaction among the people in the organization.

(iv) "People innovation:"

This is one of three alternatives that produces direct changes in the people within the organization: (a) making personnel changes, (b) modifying attitudes and behavior through education and (c) providing greater incentive systems.

C. Organizational Search

Knight combined three types of search conducted by individuals to erase performance gaps and incorporated these into a general search model in which can be predicted the behavior of an organization's search endeavors. He hypothesizes that "the programmed innovation in American firms is independent of the slack or distress conditions of the organization. A company whose slack innovations are successful will remain in a slack condition." Should the firm fail to introduce profitable new developments he predicts it would move to the distress situation. "Likewise, an organization in the distress condition is likely to move to the slack condition if its distress innovations are successful." (38)

Knight then suggests that "in a distress condition the company will initially concentrate upon the internal changes, the cost reductions, and the reshuffling of people. If these attempts prove unsuccessful, the firm will move from mild distress to greater distress and will attempt a wider and more frantic search." Figure 4 outlines the flows he hypothesizes. Note that (+) signifies a successful innovation and (-) an unsuccessful innovation.

The General Model of Organizational Search serves as a framework that describes the organizational environment, and it should be noted that the influence of Cyert and March's work (20) permeates much of Knight's.

FIGURE 4

GENERAL MODEL OF ORGANIZATIONAL SEARCH

